

Looking beyond the D.U.S.T. – building resilient rangeland communities

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Abstract. The role of towns and small business is poorly understood, yet towns are vital for the long-term viability of communities in rural and remote Australia. This case study in the central western region of Queensland (CWQ) examines the impacts of drought on rural towns and how to build a resilient regional community and alleviate hardship. Evidence was collected during drought from town businesses through surveys, interviews and a public meeting in 2017.

Towns in CWQ are especially exposed to the risks of drought, as approximately half of the businesses are directly linked to agriculture. Townspeople are major contributors to social cohesion and resilience in rural and regional communities, which are often service and maintenance centres of nationally important infrastructure such as roads for inter-state freight transport and tourism. Drought and declining grazer incomes have led to reduced spending in towns. Populations have dropped sharply, as itinerant agricultural workers leave the region. The complex economic and social flow-on impacts of drought have resulted in lower socioeconomic resilience. The majority of community members interviewed expressed a desire to build secure livelihoods, which echoes other research where existing and new rangelands livelihoods are seen as contributing to the success of the nation, a common global desire. Local organisations in CWQ display innovative business and community strategies. Future actions need to support and build on these initiatives.

A framework with the acronym D.U.S.T. has been developed, with associated actions aimed at building resilience in these communities. D.U.S.T. is appropriate for this often-dusty region, and stands for: D. Decide to act; U. Understand the context; S. Support and develop local capacities and institutions; and T. Transform regional governance.

The key for decision-makers is to work with local people who understand the contextual complexity and local needs. Actions need to be based on principles of adaptability, equity and inclusiveness, and working with the whole of the community. Building on existing collaborations and innovations as well as transforming governance and secure funding arrangements are needed. Lessons from the communities in CWQ may help other rural and remote regions build resilience to cope with the unpredictable financial, social and environmental future.

Additional keywords: drought, collaboration, engaged governance, rural towns, transformation.

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Introduction

Rural towns are vital for the resilience of rural communities (United Nations 2017), providing services and structures for crucial socioeconomic networks. Small businesses are a driving force for innovation and knowledge, as well as being able to respond appropriately to local needs (OECD 2017). The economic structure around small businesses is complex and is hampered by a lack of understanding and evidence (OECD 2017). In rural and remote Australia, few studies examine the impacts of droughts on town businesses and the role these play in local-scale economies and social networks (Stoeckl *et al.* 2007; Schwarz and McRae-Williams 2009a; Regional Australia Institute 2013). Many rural towns have broader socioeconomic value by providing services and access to locations important for tourism, agriculture, defence, long-haul transport and travel, as centres of innovation and potential population sinks to relieve

pressure from overcrowded cities (Phelps and Kelly 2019). Even though the rural towns discussed in this paper are distant from the major economic and population centres within Australia, they are interconnected with the larger socioeconomic system and have much untapped potential. When these small rural towns become unviable and services are lost, it introduces inefficiencies, reduces access, undermines prior investment in strategic assets and lessens the value of place-based industries, all of which impacts on regional, provincial and national economies. Conversely, high inherent productivity (e.g. 28% higher in central western Queensland than the Australian average) suggests strong latent potential to grow the region's socioeconomic contribution to the nation (RAPAD 2017).

More integrated, economy-wide structural policies to stimulate productivity gains have been advocated internationally for many years (OECD 2016a). Individual well being is also seen

as critical, and ‘needs to be constructed by aligning policies from the top to the relevant local scale, where people live and work’ (OECD 2016a: 3). Understanding exactly how to achieve such goals and to support rangeland communities is crucial. The socioeconomic systems of rural rangeland towns have different characteristics from the larger centres and thus require a different approach to policy and investment in order to build resilience (Maru *et al.* 2014).

The call for greater support in rural regions to benefit the nation is not new. For example Stafford Smith and Cribb (2009) called for bipartisan political support for a rangeland or drought resilience fund. The Honourable Fred Chaney called for an independent authority to operate ‘beyond the political cycle, as the custodian of the shared vision (with) the authority to keep everyone honest’ . . . ‘it would be an Outback Commission by any other name’ (Chaney 2015: 7). Whatever is developed, it is important to underpin such strategies with a shared vision, developed with rural communities, including graziers, farmers, private enterprises, businesses and townspeople, as well as by governments at different levels.

This paper focuses on town-based small businesses within rural communities, some of which may not be directly involved in agriculture but provide crucial support to regional industry and communities. Small businesses are commonly defined as those employing fewer than 20 people and are often family owned and run (ABS 2015). Across Australia, there are more than 1.2 million small businesses (Miles *et al.* 2007: 2). In rural towns these include stock and station agencies, farm machinery sales and repair, grocery stores, retail outlets, petrol stations, chemists,

motels/hotels, cafes, tourism businesses and real estate agencies. There is evidence that drought leads to declining business viability in towns, reductions in the supply of goods and services, a loss of jobs and population and, in extreme cases, the disappearance of towns (Drought Policy Review Expert Social Panel 2008; Productivity Commission 2017). Improved town-based business viability should be one approach to stabilise socioeconomic systems, which linked to other integrated interventions will contribute to regional resilience.

Resilience in this paper is defined as: ‘the extent to which our communities have the capacity, skills and knowledge to adequately prepare, respond and adapt in the face of rapid change’ (Queensland Government 2017: 4). Resilience can improve livelihoods and socioeconomic systems. The focus of resilience projects needs to be on the social aspects, which are so often neglected in resilience projects, as highlighted by Bahadur (2016) from the Rockefeller Foundation and others (Brown and Westaway 2011; Maclean *et al.* 2014). This paper helps to overcome this lack of understanding by providing an in-depth analysis of the impact of drought on town-based small business. It presents a case study of one rural rangeland region where severe and extended drought highlights the need to enhance resilience to maintain agricultural and tourism industries that are nationally important.

Central western Queensland (CWQ)

This case study focuses on central western Queensland (CWQ) (Fig. 1), a remote rural region within Australia’s rangelands. As

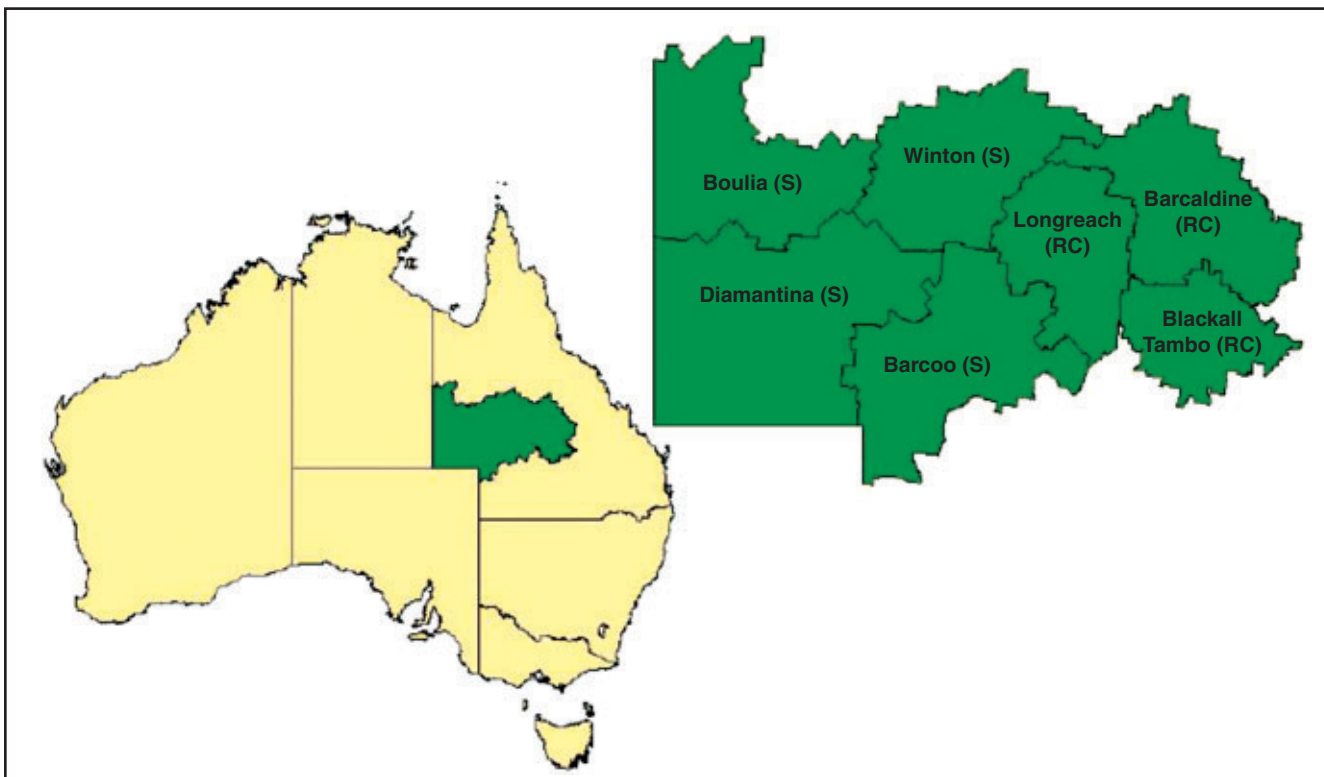


Fig. 1. Central West region, shires and regional councils (RAPAD n.d.).

such it provides evidence to inform policy and suggest actions to foster resilience in other rural and remote regions around the world.

CWQ has an area of 40 million hectares, which is 23% of the area of Queensland (ABS 2017). Businesses in CWQ are predominantly small and family owned and are unevenly distributed across the 17 towns in the region based on population. Almost half of the tiny towns have less than five businesses (Table 1). The three largest towns of Longreach, Barcaldine and Blackall are the only towns with 50 or more businesses, as each town has more than 1000 residents. Ten of the 17 towns have less than 10 businesses, and seven of these have five or fewer businesses.

The region is sparsely populated with ~10 700 people in 2016 (ABS 2016; QGSO 2018). Residents have to travel long distances to access goods and services, such as those provided by small business, and especially specialist and professional services. As such, the Australian Bureau of Statistics (ABS 2017) classifies this region as 'very remote', which is the most remote classification on the scale. Various other factors contribute to this

classification including high climate variability, scarce resources, scarce capital, low socioeconomic levels and lack of diversity in small business (ABS 2017). These factors impact on the viability of small businesses and expose them to regional risks.

The major economic contributor to CWQ is dryland agriculture, especially grazing of beef cattle and wool sheep (Table 2). The contribution has declined sharply since the current drought began in 2013. In that year, agricultural production accounted for ~50% of the CWQ regional economy (Regional Development Australia 2013) but declined to 25% in 2017 (REMPLAN 2017). Agricultural town-based businesses are not involved in producing sheep or cattle *per se* but depend on agricultural prosperity through the supply of goods and services such as veterinary supplies and repair of farm machinery. This exposes small businesses in CWQ rural towns to impacts on dryland agriculture, such as drought and market price fluctuations (Phelps and Kelly 2019). CWQ agriculture is dominated by family-owned farms, operating a range of enterprises: 'wool and sheep producers, cattle breeders, cattle fatteners, absentee landlords, family properties, large agricultural companies and organic producers' (Perkins 2013: 24). The population in CWQ is affected by the enterprise mix, with wool requiring higher labour inputs than meat production, usually under contract arrangements with town-based businesses. Since the mid-1990s, wool sheep numbers have declined considerably whereas cattle production has increased. This has contributed to long-term population and business decline (Perkins 2013; Phelps and Kelly 2019).

Construction is the next highest value industry sector, including projects such as solar farms and various new or up-graded medical facilities (Central West Hospital and Health Service 2014). Public administration contributes 9%, comprising both state and local government, with two of the largest sectors being health and education or schools. These activities are heavily dependent on public-sector funds and may not necessarily build longer-term resilience.

Tourism in the outback depends on domestic visitors predominantly and has strong potential for growth. In CWQ, tourism has increased in value by ~9.5% per annum from 2014 to 2017 and is considered one of the economic success stories of the region. The total regional contribution is 6%, based on an amalgamation of activities including accommodation, cafes, and cultural and recreational services (REMPLAN 2017). Tourism is

Table 1. Population and businesses per town

Towns in Central West	Total number of businesses (Kelly 2018)	Population in 2016 (ABS 2016)
1. Alpha	25	335
2. Aramac	4	299
3. Barcaldine	60	1422
4. Bedourie	3	122
5. Birdsville	9	140
6. Blackall	48	1416
7. Boulia	12	301
8. Ilfracombe	6	259
9. Isisford	10	218
10. Jericho	3	115
11. Jundah	2	106
12. Muttaborra	3	88
13. Stonehenge	3	44
14. Tambo	23	367
15. Windorah	5	115
16. Winton	36	875
17. Longreach	191	2970
Total (town population)	443	9192

Table 2. Economic outputs per industry as at July 2017 (REMPLAN 2017)

Industry sector	\$M in 2017	% of regional output	Notes (SB = small business)
Agriculture, Forestry and Fishing	\$410	25%	Only \$35 M or 10% is related to SB, most of this sector is corporate or family owned rural properties
Construction	\$279	17%	New or renovated hospital and health facilities are a significant component; some SB
Public administration and Safety	\$147	9%	Mostly local and state government
Tourism	\$105	6%	Majority is SB
Transport, postal and warehousing	\$77	5%	Majority is SB
Health Care and social assistance	\$68	4%	Mostly government and church groups
Manufacturing	\$58	4%	Majority is SB, e.g. steel products and metal fabrication
Retail trade	\$51	3%	Majority is SB
Mining	\$50	3%	Corporate: very limited in CWQ
Education and training	\$49	3%	Mostly government; some SB

seen by town business people as an important activity that maintains cash-flow as it is not affected by drought. Unlike many rangeland regions in Australia (Stoeckl *et al.* 2007) or around the world (OECD 2006), the mining sector is not significant in CWQ as there are no businesses associated with mining in CWQ.

Employment fluctuates as the output of industries changes. While twice as many people are employed by agriculture, town-based small businesses still employ a significant proportion of the regional workforce in CWQ (ABS 2017). Employment then influences population as people leave town looking for work.

The changes to economic and social structures, population and town business in CWQ are thus complex. This paper aims to create a deeper understanding of regional drought resilience within rangeland towns by interpreting the CWQ case study through a review of resilience literature, available statistics and local perspectives. This research explored the social and economic impacts of drought on town-based small business with the aim of developing actions to build more resilient rural towns and regional communities.

This paper first presents a summary of the key economic data from the business surveys and then uses local interview data to present results regarding social impacts of drought. The results section ends by examining the inter-relationships between the economic and social aspects. The discussion and interpretation use a resilience framework, adapted from Maclean and colleagues (2017). Actions to build community resilience are suggested under the categories of the newly coined acronym of D.U.S.T. – Decide to act; Understand the context; Support local capacities; and Transform regional governance.

Methods

Locally relevant data, collected at a fine scale, are required for remote regions as they are sparsely populated with huge distances between towns (Stoeckl *et al.* 2007), leading to different economic structures compared with larger communities. In CWQ the amalgamation of data to a regional scale becomes meaningless for small business and for those making decisions about these towns. This research helps overcome this gap and improves understanding of the local scale of rural and remote towns and their small businesses.

The philosophy underpinning this research argues that informed local people need to have input into decision-making processes that affect their lives. The focus was on recording the perspectives of poorly researched town-based small-business owners across the region. As such data about the impacts of drought and drought assistance on small business in CWQ were collected through:

- (1) Written surveys of town business owners or Chief Executive Officers (CEO) undertaken in 2015 ($n = 56$, 29% return rate) and in late-2016/early-2017 ($n = 83$, 19%). Many businesses are owned by couples; in these cases, both partners responded to the survey. As a result, the study does not explore gender issues;
- (2) Semi-structured interviews in September–October 2017 ($n = 35$); 17 respondents were female and 18 were male; and
- (3) Public meeting ($n = 45$) in October 2017 in Longreach. Everyone was welcome, and invitations were placed in

prominent places around town, and posted to all business in Longreach.

The survey questionnaires were conducted by the Western Queensland Drought Committee (WQDC), with surveys in 2015 distributed to all small businesses within Longreach, and in 2016–17 to all small businesses across CWQ. Interviews were conducted by the lead author with randomly selected business owners across CWQ.

Rigour was provided through triangulation, using three different methods of data collection. The surveys provide representative data across the region, whereas the semi-structured interviews and public meeting provide a more in-depth understanding of some of the comments made in the surveys. The first survey suggested that rural towns have complex inter-relationships that are different from metropolitan contexts. Evidence to explain this complexity and provide an in-depth understanding was framed by a literature review of resilience. This literature and the data both helped guide suggestions on how to address the impact of drought.

Small business survey results

Results from the surveys (2015 and 2017) show a significant reduction in turnover for almost all town-based small businesses across the region, largely linked to drought. The impact varies for different business types. Town businesses servicing agriculture face the highest impacts, as they deal directly with graziers and immediately feel the pinch of reduced spending. Agricultural businesses have had a variable but consistently negative turnover (Fig. 2). As graziers' incomes decline, rural workers such as fencing and mustering contractors and shearers feel the effects first hand. As rural workers are laid off, this further reduces spending in town businesses. Main-street small businesses, such as retail clothing shops and the IGA (Independent Grocers of Australia) supermarkets, as well as services, face the flow-on impact of the drought, as a smaller proportion of their sales are directly with graziers.

Tourists help buffer the impacts of drought to some extent; thus retail has not declined as sharply as services (Fig. 2). Nevertheless, tourism turnover is similar to other businesses; it has declined substantially, with the only positive aspect being that tourism businesses started with a positive turnover.

Decline in turnover in town-based businesses across the region are similar to those in the largest town in the region, Longreach. Here businesses reported a 60% reduction in 2014–2015 turnover and a further 26% reduction in 2015–2016 (Survey 2017). Overall turnover decline reported was between 50% and 80% from 2012 to 2016. The overall decline in turnover is complex, as it is exacerbated by on-line shopping for everything from groceries to machinery as well as by population decline. Increasing fixed costs and seasonality of some industries were also identified as impacting on economic viability (Survey 2017). Taxes (such as GST or goods and services tax), bank loans and electricity bills were among the top four most difficult costs to be met by businesses in CWQ. Seasonal temperature changes mean that most tourism businesses open only between April and October and depend on this peak tourism season to generate income. All other business sectors also reported a decline during the intense heat of summer.

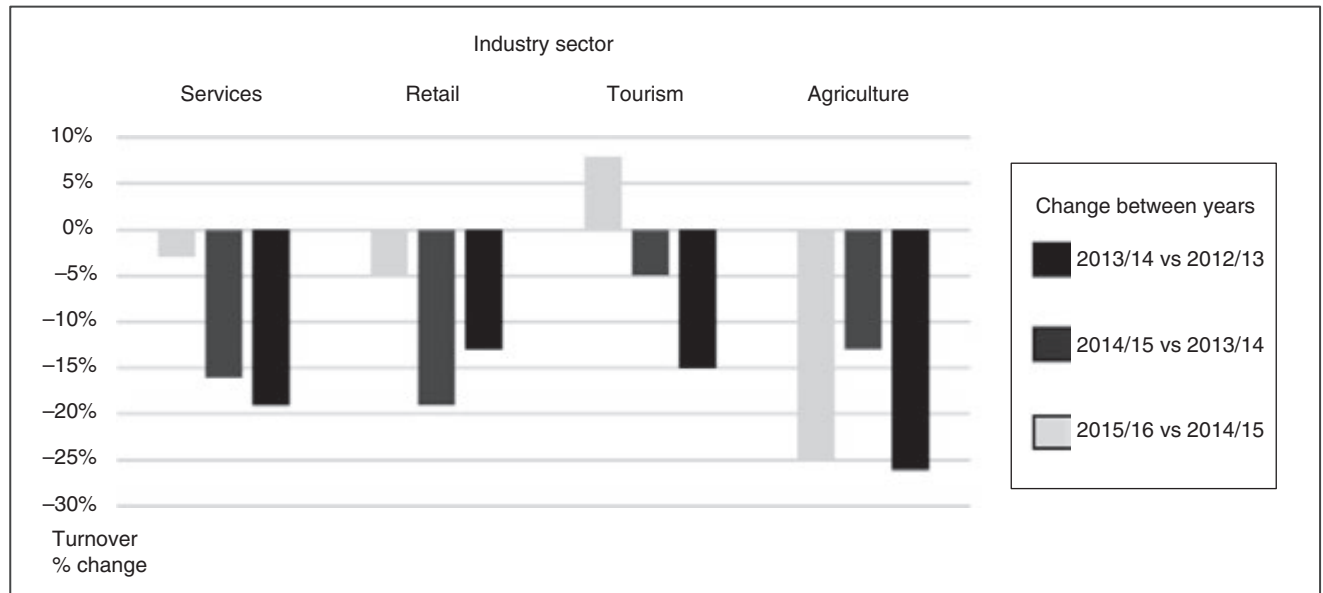


Fig. 2. Change in turnover between 2012 and 2016 per business sector.

The impacts on the economy and the social life in CWQ are best understood by using the interview data, as well as the survey. The next section presents data from the interviews and public meeting, and links relevant literature to the discussions where appropriate.

Impacts of drought on CWQ town business

Most small businesses are vulnerable to drought. Many people interviewed made comments such as:

- ‘Devastation of the rural industries impacts severely on local town business – from retail to service providers – no one was untouched’ (Survey 2017).
- ‘The towns have suffered a lot, not only the graziers’ (Interview 8).
- ‘Drought has the full ripple effect, it affects every aspect of our business, it has had a significant effect’ (Interview 3).

However, business owners recognise that ‘the downturn in business is not only caused by drought’ (Interview 13). Changes in the mix of industries also contribute to economic decline. The following story provides a personal perspective to underpin the dry accounting figures:

‘Our family had a café . . . and late every afternoon, 87 roo [kangaroo] shooters would go to the café. They would get fuel, buy some cans of coke, four rounds of sandwiches and some ice for the esky. So, \$30–40 was sold every night to each of these roo shooters. Now, nothing’ (Interview 15).

Drought is an extra challenge to rural business, in addition to economic pressures faced by business in larger towns and cities that have higher populations and more diverse economies. Ongoing droughts may be the tipping point for some town-based small businesses; further research is needed to assess when and where this point occurs.

Economic impacts

As most of the town-based small businesses in CWQ are reliant on agriculture, drought affects regional outputs (Table 2) and regional expenditure. Many interviewees commented on the impacts of the decline in rural producer spending on town business (Interviews 2017); the rural ‘cash drought’ becomes a town ‘cash drought’. The situation is complex with interrelated links.

Several small business owners discussed how the decline in agriculture and public administration has to some extent been balanced by the increase in construction, mainly health infrastructure (Interviews 2017). The significance of the construction sector is obvious from the regional output of 17% (Table 2), second only to agriculture in CWQ. The impacts from these changes in regional outputs are likely to be significant, given that all of these industry sectors probably have high business-level multiplier effects. Several interviewees mentioned the impact of public servants leaving the region, most around 2012–2013 (Kelly 2018). In CWQ, public administration contributes only 9% to the regional economy, but this sector is significant in other ways. Public servants have regular income, which means they can spend money in town; and thus, publicly funded positions represent a consistent income stream for many small businesses (Interviews 2017). Public servants and their families often volunteer and provide skills and knowledge to their communities. Thus, in addition to providing regular expenditure into town business, some sectors provide various other benefits to their local communities.

Examining the flow-on effect from the drought provides some indication of the complexities and multiplier effects relevant to CWQ. This spiral of negative economic impacts is outlined next.

Employment decline

As mentioned previously, declining employment opportunities first affects rural workers, who often live in

town, then workers in town businesses. The impact of drought on rural and town workers is evidenced by comments such as:

- ‘My partner is a contract musterer, and so he has felt the effects of the drought. If they have not got stock, they are not mustering . . . If the budget is tight, then they don’t get help, they tend to do all the work themselves’ (Interview 3).
- ‘Properties that used to employ a couple of people, now they don’t . . . All the town businesses are affected by that’ (Interview 8).

All town businesses reported changes for employees, either in putting staff off or reducing hours. Survey respondents (2015, 2017) reported that staff numbers declined in the services and retail sectors whereas the number of staff employed in tourism increased slightly. Reduced hours for employees were reported in all sectors: in 57% of businesses in the Tourism sector, 33% in the Agricultural sector, and 45% in the Services and Retail sector (Survey 2017). Of concern is that more than 40% of all small business owners in the region cut costs by not paying themselves wages. This trend has increased year by year across all sectors. Interviewees’ comments reflect this, at times, distressing situation: ‘In this business, it is a family business, we cannot pay ourselves, our wages are very minimal. I cannot afford to have people on staff’ (Interview 13), because: ‘The drought means businesses are short of staff, they (owners) do most of the work themselves, and it is difficult to get away’ (Interview 1).

As a consequence, several people expressed a desire to sell their businesses, but declining asset value (e.g. real estate) has made this difficult.

Asset value declines

Declining population and declining incomes have impacted on the value of homes and business assets. Declining real estate prices mean that it is difficult to sell businesses and homes. For some people it is even more difficult to sell as they would be left with a mortgage:

- ‘One of our businesses has been for sale for 15 years’ (Interview 15).
- ‘There are people who want to get out, and they cannot take a cut in price, as it would not cover their mortgage. They still have to pay off their mortgage’ (Interview 4).

As a result, some people feel trapped and unable to see a way forward, which is very difficult to manage. However, some people found strategies to assist them, which are outlined in the section ‘Adapting to the impacts of drought’.

In summary, drought contributes to a declining economic spiral. Declining incomes for graziers, lead to a loss of employment for rural workers, which in turn means town-based small businesses suffer a ‘cash drought’. Employment for town workers declines, then both rural and town workers and their families relocate looking for employment. This population decline compounds the reduced income for small businesses. Economic impacts are inextricably linked to the social decline of town communities, which is explored next.

Social impact of drought

Low incomes and low employment opportunities are factors of a low socioeconomic index, which links to low spending ability of

local people in town-based small businesses. In the CWQ, the local government areas of Barcoo, Blackall, Boulia, Diamantina and Winton were among the most socioeconomically disadvantaged areas in Queensland and Australia (Central West Hospital and Health Service 2014). The socioeconomic index for the local government area of Longreach is much higher, but still only in the middle compared with the rest of Queensland. The low socioeconomic situation of CWQ is exacerbated by the declining economic situation that is linked to declines in social characteristics of population, such as loss of employment opportunities, and sometimes lower physical health and mental health outcomes (ABS 2011). In the CWQ region, trends reflect those in other regions around the world (Maru *et al.* 2007) the lack of cash flow, depressed income and loss of employment opportunities contribute to a ‘population drought’ through out-migration as itinerant agricultural rural workers leave to seek employment in other regions (Turhan *et al.* 2015), resulting in fewer volunteers, declining local charity group and club membership, diminished services and reduced liveability.

Population decline

Declining population compounds existing issues of a sparsely populated and very remote region. Net migration out of the region in the years between 2007 and 2016 (Fig. 3) shows ~2100 people left CWQ with ~10500 remaining in 2016 (ABS n.d.). The population decline corresponds to periods of the two recent droughts; the first ended in 2007 and the second current drought started in 2013. Evidence of this out-migration is supported by the drop in the number of students registered in school and by anecdotal evidence.

Part of the population decline is due to the economic situation – employment opportunities decline both in rural and town areas, people leave looking for work elsewhere. Declining rural population is also caused by the changes in the mix of industries (Phelps and Kelly 2019). Additionally, state government policy changes meant many government staff left town in 2012–2013. As people explained:

- ‘Twenty years ago, we had a roo [kangaroo] industry here’ (Interview 15).
- ‘Our main business was from the shearers, the kangaroo shooters . . . that has changed’ (Interview 7).
- ‘Those government cut-backs really hurt a lot of little towns. It has slightly recovered now’ (Interview 4).

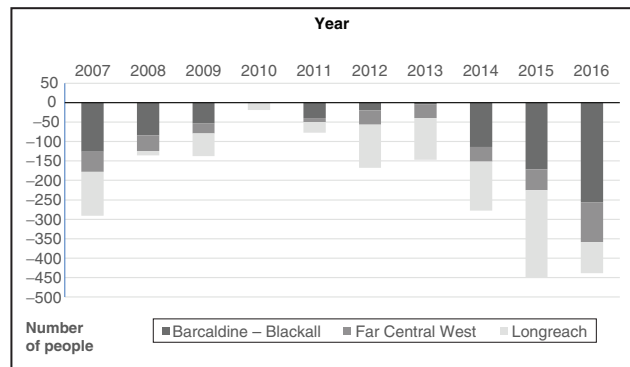


Fig. 3. Net out-migration (Australian Bureau of Statistics 2017).

Even one family leaving has an impact on these towns, which already have small populations. Young people often leave seeking better education.

Education

The population of CWQ has a lower level of education than the Queensland average, with 46% versus 59% respectively having completed Year 11 or 12 as their highest level of schooling (ABS 2016 census). The loss of educational opportunities was identified as one of the effects of drought across rural Australia (Drought Policy Review Expert Social Panel 2008; Schwarz and McRae-Williams 2009b). One Queensland rural producer organisation, AgForce, urged government to provide education assistance for all drought-affected rural students (AgForce 2016). At present, more support is available for children of rural producers than for those with town-based parents. Young people being sent away to boarding school is reasonably common in CWQ, but more so for rural producer families than in town-based families.

Drought can necessitate sending children away, especially if one or more people in the family are away from home for extended periods of time for work, for example:

- *'In the drought, I went mining for 10 weeks, because we spent everything we had in the bank . . . My daughter was sent to boarding school, I went mining and my partner stayed at home – it was really tough'* (Interview 3).

When family life is suffering, so does the social life of individuals and their enthusiasm to volunteer in community activities.

Declining social life and volunteering

Town business owners reported negative impacts of economic decline on their personal life:

- *'I don't really go out, I am so buggered when I get home from work'* (Interview 12).
- *'I play golf once a week, that is all I can afford . . . I have eaten out at the pub once in the last 4–5 years'* (Interview 13).

The lack of discretionary money, exhaustion from long working hours, negativity and not feeling like socialising, were common reasons given for not engaging in social activities. Businesses can no longer support social activities financially and find it difficult to provide staff time to volunteer when times are tough, as one person explained:

- *'We are a business that never says no to a donation and I have found it hard to decrease the value of donations, but we have had to. Sometimes wage money is hard to find'* (Survey 2017).

Nonetheless, a relatively high percentage of people volunteer in rural and remote communities with 30–40% people volunteering in CWQ, compared with ~19% in other areas of Queensland (ABS 2017). However, people interviewed as part of this research indicated that finding volunteers has become more difficult as the overall population declined, with comments such as:

- *'The impact of the drought is visible in the community, as there are fewer volunteers to do things. It is usually the*

same people that do everything, but because there are less people around, it is more difficult' (Interview 1).

- *'The same people do the organising all the time, just like most places, it tends to be the same people all the time'* (Interview 2).

Even though volunteering rates remain high over time, as the total population declines there are fewer individuals available to volunteer. Kelly (2018: 34) estimates that ~630–840 potential volunteers have left CWQ due to outmigration, which depletes the total volunteer numbers and places additional stresses on the remaining pool of volunteers. Hence, events that rely on volunteers such as agricultural shows, are more difficult to organise and run. For some clubs, membership becomes so small that it becomes very difficult to function or meet requirements, and the clubs withdraw from providing services or close.

Drought is linked to fewer social activities. Attendance has dropped for many activities, but not for all, as one person explained:

- *'There are less rodeos and that sort of thing because there are no livestock about. The events still happen, the council puts on drought concerts and things like that. I have heard that attendance at the big events is quite good, because people decide they want to go and let their hair down and enjoy a night of music or something. However, small events are less well attended'* (Interview 5).

Declining numbers of events mean fewer opportunities for socialising, and this seems to have occurred at the same time as services are declining, or even closing.

Services decline

People in CWQ identified poor services and infrastructure, including schools, Internet, roads and medical facilities. Many of the towns in CWQ have primary schools for the first six years of schooling. Out of a total of 23 schools in CWQ, only four high schools cater for students until Year 12 and these are located in the larger towns of Longreach, Barcaldine, Blackall and Winton. Longreach has the largest state primary school in the region, and enrolments have dropped by ~20% since 2008 (from 310 children) as families have left (Kelly 2018: 30). Impacts across the region are similar, which means some of the smaller schools are at risk of closure.

Many children in the region are sent away to boarding school. As one person explained:

- *'The high school . . . does not have all the subjects that kids need to do. So, I have actually sent my oldest boy away to boarding school this year. This is probably the reason why some families leave, when it is time for their kids to go to high school. They cannot afford the expense of boarding school'* (Interview 6).

The lack of adequate facilities at the local schools was one reason some parents chose to send their children to boarding school. Children living on rural properties are often sent away because of the distances between school and home. Many people at the public meeting (2017) expressed concern that children sent away for education rarely return. The provision of better services

would help retain and attract people to CWQ, as in other rangeland regions.

The Internet did not seem to be well used by businesses, and those that did use it complained about the quality with comments such as: *'it is slow, and has problems with time out, even the telephone is unreliable'* (Interview 2). An initiative by the Blackall-Tambo shire to connect everyone in CWQ to WiFi is underway (Survey 2017; Interviews 2017). As with the Internet, people seemed resigned to poor roads. There was no shortage of comments such as: *'They cannot fix the roads much when there is no sub-soil moisture, so you just gotta live with them'* (Interview 8).

Human physical and mental health services

Medical services and facilities were also criticised by some, but the recent improvements were also noted, as major changes are under way:

- *'People out here in Jericho want a doctor. To get a permanent doctor, you need a certain number of people – Queensland Health (government department) has a set population threshold of 800 or so people, before you can get a doctor'* (Interview 9).
- *'One of the most positive things that's happened is the local hospital board. Doctors are not in a fly-in/fly-out system'* (Public meeting).

Significant resources have been spent in CWQ on infrastructure for medical services (Interview 20); and these infrastructure projects contribute to construction being the second largest contribution to GDP for the region (REMPAN 2017). This is all part of the Central West Health Services aim, which will allow more patients to be treated locally. This avoids the need for costly trips to larger centres, where people are away from family and friends (Interview 20); and helps reduce costs for the state government.

Medical services have already been transformed in CWQ. The system of fly-in/fly-out general practitioners (medical doctors), so common in Australian rural and remote regions, is now rare in CWQ. Local systems have been put in place to ensure local doctors are supported and have a safe working environment (Interview 18). The Central West Health Services has developed systems to support doctors (Central West Hospital and Health Service 2014: 5). Overall, health services have improved dramatically, and the process and systems developed could provide a model for other rural and remote regions.

Chronic disease, preventable hospitalisation and poor mental health characterise the CWQ region (Central West Hospital and Health Service 2014). Rates of disease are 21% higher than the state average; and mortality rates are significantly higher than the Queensland average (Central West Hospital and Health Service 2014).

Drought certainly increases stress and anxiety in rural communities, with rural farm owners, rural workers, town business people and other residents all affected. Emerging literature links prolonged drought to increased mental health issues (Edwards *et al.* 2014). However, there is not strong evidence to indicate that drought causes increased suicide rates, even though some literature suggests a correlation (Drought Policy Review Expert Social Panel 2008). It would be self-

defeating to assume that increased suicide rates are a natural, or acceptable, consequence of drought. People interviewed in CWQ tended to make comments such as: *'We are alright, most of the bush is alright. We can handle drought, it is part of our make-up'* (Interview 8). Whether these comments reflect characteristics of a stoic or resilient community is difficult to know. The distinction between stoic and resilient was explained by one local as: *'There is a lot more stoicism in the bush than resilience . . . Stoicism is where you grit your teeth and survive; but resilience is where you grit your teeth, you survive, and you bounce back'* (Interview 7). Stoicism can hinder people from seeking help.

The huge distances are a problem for the provision of medical services, education and transport. The lack of understanding of this and other contextual issues by service providers from coastal or metropolitan areas, further compounds the challenges for small businesses. The complexity makes the situation difficult to understand; and service providers and policy makers need to talk to the locals, a common cry in most interviews.

Socioeconomic spiral

The impact of drought in the social and economic situation in CWQ is inextricably linked in a complex and compounding cycle (Fig. 4). The survey, interviews and public meeting suggested that town businesses are especially exposed to the risks of drought in CWQ as approximately half are directly linked to agriculture, such as small businesses selling and servicing farm motorbikes (Kelly 2018). Although socioeconomic instability is already reported in rural and remote areas (Maru *et al.* 2007; Stafford Smith and Cribb 2009), this paper focuses on drought as a trigger leading to greater instability, intensified impacts on local people, and reduced resilience (Fig. 4). Meteorological drought reduces farm productivity and reduces agricultural cash flow (Phelps and Kelly 2019); this negative economic spiral is represented as a 'cash drought' in Fig. 4 (grey boxes on the left). In turn, the cash drought spreads through reduced income for agricultural contractors, reduced expenditure in main street businesses, and escalates into a loss of employment opportunities, out-migration and destabilisation of social networks, a negative social spiral as shown in Fig. 4 (boxes on the right).

Our data suggest these impacts are staggered, perhaps taking 6–12 months for town-based small businesses to experience declining income beyond the onset of meteorological drought. Most businesses reported trying to keep staff employed for as long as possible, but as their turnover is severely reduced, hours are reduced for town-based employees and eventually job losses ensue. In CWQ, this process took approximately three years, and the declining employment opportunities led to a 'population drought' as farm and then town workers left looking for work.

This out-migration of workers and their families means fewer volunteers to organise social events, declining capacity of sports and service clubs, the rural show, gymkhanas and the like. Services and schools often close, for example the gym in Longreach closed in the last couple of years. This reduces liveability, meaning it is more difficult to retain young people or attract new people. The negative economic and social spirals tend to feed off each other, and the negative impacts escalate. The combination of economic and social decline leads to reduced socioeconomic resilience. The relative impact on towns will

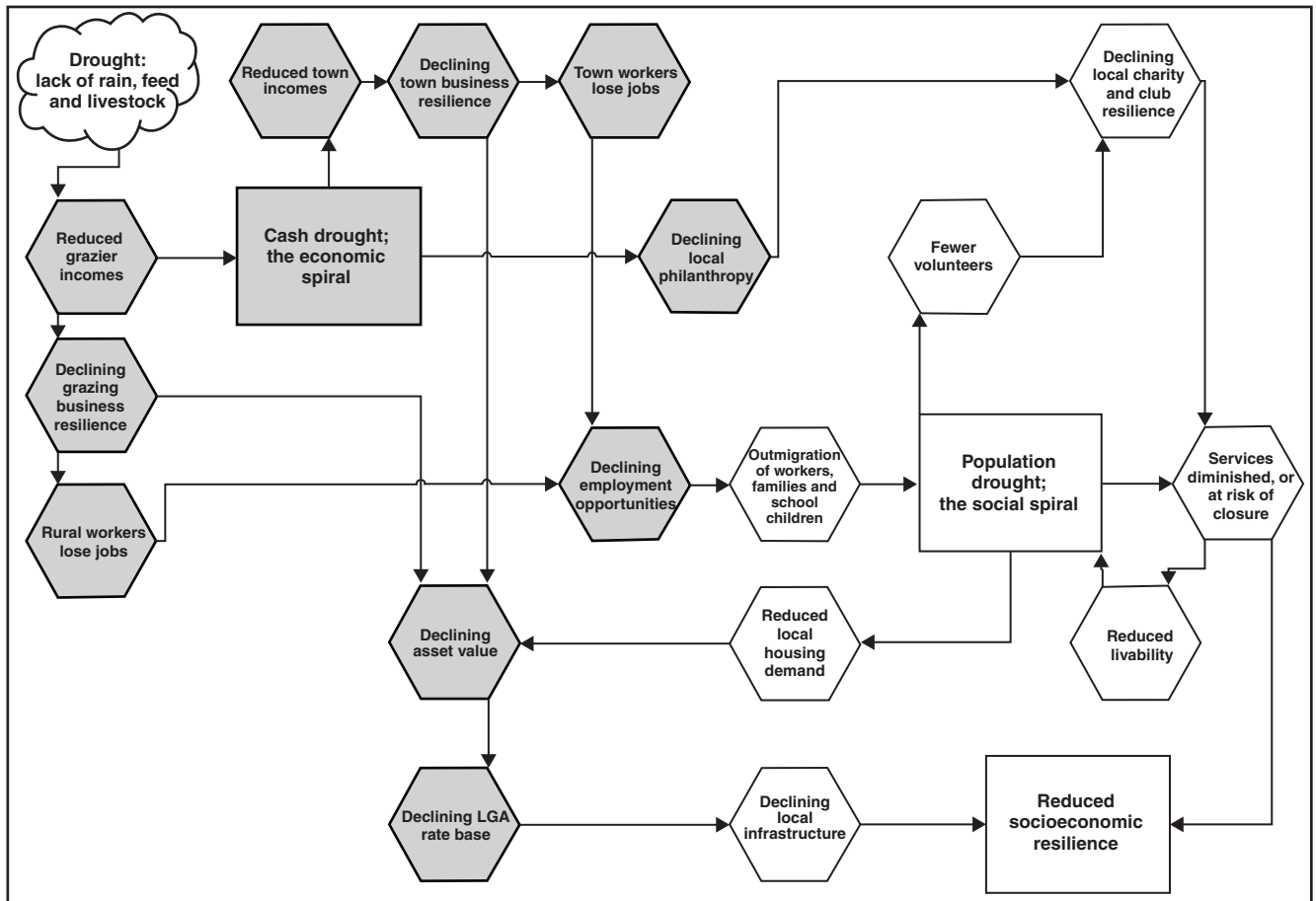


Fig. 4. Flow-on effects from drought: economic and social (Kelly *et al.* 2017).

depend on their size and dependence on agriculture, compared with having a diversified economic base.

Economic and social impacts, as well as grazing enterprises and town business, are clearly intertwined. The impact on town businesses of reduced spending by rural producers is highlighted by this research (Kelly 2018). ABARES (Australian Bureau of Agricultural and Resource Economics) calculations show that while: ‘A farmer (or grazier) may only spend 10 per cent of their total expenditure locally . . . farm expenditure represents as much as one-third of small town economies’ (Drought Policy Review Expert Social Panel 2008: 21).

The multiplier effects of the other industry sectors in CWQ were also mentioned in interviews; for example the public sector was seen as having a high economic and social multiplier. Public servants have a stable income and provide skills as volunteers in their community. Expenditure is important when determining multiplier effects, but expenditure patterns vary between the various business sectors (Stoeckl *et al.* 2007). The location where inputs are purchased is also a significant factor in determining multipliers and whether inputs are purchased in or outside of remote regions. When inputs are purchased in the local region, there are relatively high business-level multipliers; for example health and government use inputs provided by retail and other local businesses (Stoeckl *et al.* 2007). Conversely, business sectors that spend less on wages and other inputs from outside the

local area have lower business-level multipliers, such as the accommodation and transport sectors (Stoeckl *et al.* 2007: 2). Overall, human health and public administration have a large multiplier effect in CWQ, and government spending patterns can have a substantial impact on small communities.

The economic structure and relationships in these rural and remote regional communities is different from larger Australian communities. Policy makers often overlook this. Factors that need to be considered include workers’ incomes (income multipliers) and the proportion of workers employed in different sectors (employment multipliers). Simply considering regional expenditure and regional output is not sufficient to determine the ‘importance’ of a sector to the regional economy (Stoeckl *et al.* 2007: 10). The multiplier effects of the various business sectors are often ignored when government investment decisions are being made.

The complex interrelationships between economic and social contexts need to be understood so that policies and decisions do not produce unintended negative consequences. In addition, economic and social decline tends to compound and exacerbate the issues for the community: ‘There is a critical threshold that, once passed . . . changes are very hard to overturn’ (Morton 2017: 1). All stem from the reliance of town-based small business on rural expenditure, in every sector of the regional economy.

Treating the remote communities as an *entity* rather than separating country and town people is an important message for policy makers. Several CWQ townspeople (Interviews 2017) expressed frustration that government drought support is mainly available to agriculture-related businesses, which raises issues of fairness and equity. Too often in the past, drought policy has focussed only on the pastoral sector (Phelps and Kelly 2019). The viability of small-medium size businesses is regarded as a prerequisite for resilience in many rural areas (Miles *et al.* 2007; OECD 2017). OECD (2017) recommends an integrated approach to building resilience, with the public and private sectors working together with non-government organisations and civil society. The needs and contributions made by the towns must be included in planning, and the community needs to be treated as a whole to achieve resilience.

Strong community networks where local people support each other buffer rural people from the negative impacts of drought, such as economic and social decline, and build community resilience. Many businesses in CWQ have already adapted to the on-going drought conditions, finding new ways to stay viable and hence build resilience.

Adapting to the impacts of drought

Local business reported (Interviews 2017, Public meeting 2017) three key strategies to become more adaptable to low economic activity during drought – diversification, innovation and learning.

Diversification

Diversifying into tourism is a planned strategy in CWQ, encouraged by the collaboration of local governments (RAPAD 2017). Tourism is one of the success stories in the region (Interviews 2017), with tourists drawn to attractions such as major museums in Longreach, Barcaldine and Winton. The award-winning tourism business Kinnon and Co. was founded by local graziers to diversify their income-generating activities during drought (Kinnon and Co. 2016).

Two-thirds of all businesses surveyed (2017) have diversified, but not all into tourism. ‘Tambo Teddies’ is one local businesses that started as a form of diversification during drought almost 25 years ago. It produces teddy bear toys from local wool and is run by local women. One woman said:

- ‘Prior to the drought, probably 70-80% of my business was from western Queensland. Now only 5% comes from western Queensland, and the rest of my work is from other parts of Queensland, Northern Territory and Western Australia’ (Interview 4).

Other business people argued that still more diversification in the region was needed to help build resilience and stabilise the regional economy, including the return of government staff (Interviews 2017; Public meeting 2017). Not all small business people interviewed were as optimistic, with some expressing an aversion to risk and a lack of understanding of how to implement diversification strategies.

Innovation

The second strategy is innovation. Many local business people mentioned that they had tried to ‘do things differently’ or to develop ‘new ways of operating’. Although those interviewed

rarely mentioned the term ‘innovation’, many of their ideas were innovative. Two of the high-profile examples of innovation were the *Qantas Founders Museum* and the *Australian Stockman’s Hall of Fame*. The Jockey Club in Longreach also was seen as innovative, with horse racing undertaken in conjunction with community activities, such as birthday parties, to help make the venue profitable. Locals explained that the success of the Jockey Club is built on an initial grant from government and on the work of dedicated volunteers (Interviews 2017).

Learning

About half of the small business owners interviewed said that they needed some training to be successful in diversifying or in doing things differently. When asked about whether they attended training and networking events, they made comments such as: ‘I do go to anything I can get to, I try to get to what is available’ (Interview 8).

The most helpful topics mentioned were business skills, especially strategic business skills, especially for people in the retail and tourism sectors (Survey 2017; Interviews 2017). Training topics related to governance were rarely mentioned by those interviewed in CWQ; however, a couple of people said things like: ‘Perhaps we could have some networking training. It seems like such an obvious thing, but a lot of people do not know how to start’ (Interview 1). The literature highlights the need to develop ‘appropriate networking, collaboration and entrepreneurial skills’ to make transformative changes, especially to improve governance (Walker *et al.* 2012: 57). Although local people may not recognise this need, resilience needs strong community networks and new collaborations between various organisations and governments. Similarly, Maru *et al.* (2014) highlight the need for networking between as well as within region.

In contrast to the motivated people, about half the town businesses surveyed said that they rarely, if ever, attended training courses or workshops. Explanatory comments included:

- ‘They do have all these workshops and things, but as an owner/operator I cannot get away. If it is after hours, I have to play mum and feed animals’ (Interview 3).
- ‘I would love to go to more workshops. I am very conscious of this, as I know I have to keep up on my skills, but I just cannot afford it’ (Interview 4).

The lack of money, lack of energy and lack of time were some of the reasons given for not participating in training. Further investigation revealed other reasons were instrumental in whether people attended or not. The way training is delivered and who is delivering the training are probably more important than the topics offered; this finding is supported by other outback Queensland research (Kelly 2005).

Coaching and mentoring were preferred to formal workshops by many small businesses owners, who said they were too tired after work and/or had family commitments and animals to feed (Interviews 2017). Also requested was follow-up support. The small business Financial Counsellor was particularly appreciated by business owners interviewed. He was seen as a trusted and credible source of information, who went to people’s work places rather than running workshops: ‘The Financial Counsellor was always there, you could ring him about anything’ (Interview 10).

An optimistic attitude does influence people's ability to learn and to cope with changes. The more optimistic small business people made comments such as:

- *'It is important to look forward . . . Like any community, some people have a victim attitude'* (Interview 7).
- *'People's mood changes when there is rain'* (Interview 2).

Country people are often portrayed as hardy, enduring and stoic. Stoicism can hinder people's ability to ask for help or to seek training, whereas resilience can help people learn new ways to adapt and change.

The capacity to diversify, innovate and learn new skills are components of adaptability, which can be high or low depending on the region. The area around Longreach has a high adaptability index relative to other rural regions of Australia (Productivity Commission 2017). This ability to be adaptive seems well supported by evidence collected from several forward-thinking tourism and event-based businesses (Interviews 2017; Public meetings 2017). Unfortunately, other areas in CWQ do not seem to have a similar ability to adapt to change. Organisations based in Longreach, the largest town in the region, run programs to help others across the whole region.

The actions adopted by many small businesses in CWQ indicate considerable community resilience. Diversification, innovation and learning all fit with the attributes needed for community resilience in the literature (Bahadur 2016; Walker *et al.* 2012; Queensland Government 2017). Other strategies to help build resilience in rural and remote communities such as in CWQ are addressed next.

Community resilience

The role of small business is vital in building community resilience. Various attributes are recognised as important for communities to be able to adapt and cope with change, such as increased incidence and/or severity of droughts, including:

- Knowledge, skills and attitudes;
- Community networks;
- People–place connections;
- Infrastructure and services;
- Diverse and innovative economy; and
- Engaged governance (adapted from Maclean *et al.* 2014).

The first five attributes build towards the last, engaged governance, which is essential for building resilience in rural and remote communities. Transformation is a key element to fostering social change, as highlighted in the literature (Herbert-Cheshire 2000; Walker and Salt 2006; Walker *et al.* 2012; Brown and Lambert 2013). All these attributes are linked, and thus programs to support each attribute need to be integrated and coordinated.

Knowledge, skills and attitudes

Education or training programs to build knowledge and skills are often seen as the most important way to build resilience (Kotey 2014; Cole 2016; Queensland Government 2017). However, education and training may not be the primary determinant of positive economic outcomes (Walker *et al.* 2012: 39).

Given that only about half of the small business operators in CWQ are accessing training, questions need to be asked about the topics offered, and the way workshops and seminars are provided. The considerable effort currently put into training by organisations in CWQ may not be meeting a locally defined purpose. It is important that local people be involved in assessing local needs and helping to set the agenda. The attitudes of small business people with regard to training are not always positive (Interviews 2017) and this emphasises the need to listen to local people's views before developing training programs.

Thus, some of the assumptions about the links between training to enhance knowledge, skills and resilience may be overstated. Training programs are needed but are not sufficient on their own; these need to complement other programs such as those to enhance community and business networks.

Community networks

The strength of relationships between people and community networks is important when building resilience, but perhaps not well accounted for in regional programs. *'Relationships matter'* is well recognised in disaster recovery (NRM Regions 2017; Queensland Government 2017). Social events and festivals can play a constructive role helping people get together in times of stress. Policy makers and government need to assist with funding to help support community networks.

Both this research and the literature (Botterill and Wilhite 2005; Sartore *et al.* 2008) suggest that people do not want to go to events labelled 'drought', 'mental health', 'depression' or other titles that were perceived as negative. Local people recognised the importance of community, and strong community networks do exist in CWQ:

- *'When there is a tough time, everyone is there to help you out . . . that is what they do out here; and that is what I love about out here'* (Interview 15).
- *'People in the west will give you the shirt off their back if it is for a good cause'* (Interview 13).

A couple of the larger tourism businesses have a philosophy of engaging the local community and building community capacity whenever possible. This approach recognises the importance of building community networks for resilience. For every project proposed, one CEO asked: *'How can the community participate and benefit from this?'* (Interview 24). From employing young locals to holding children's art exhibitions, several programs have been developed to encourage locals to use the venue. This philosophy is integral to the success of this business and could be adopted more widely by other businesses for mutual benefit of the business and the local community. In general people are keen to help their community as they want to stay in the region.

People–place connections

People in CWQ expressed their love of their towns, with several comments like: *'Longreach can show people the social and lifestyle benefits of living in the bush, for example, no travel time to work, sunsets, slower pace, friendlier people. It is a great place to live'* (Public meeting 2017). This indicates a strong

people–place connection, an important component of resilient communities (e.g. Maclean *et al.* 2014). Communities of place are likely to become more important under continued globalisation, as one of few assets that is not mobile (Stafford Smith and Huigen 2009).

People want to build a sustainable livelihood based on their connection to the place. This is most evident in tourism and one example is The Kinnon and Co in Longreach (Kinnon and Co 2016). Sustainable livelihood development is based on people's desire to build a business that allows them to stay in a particular place (Ross *et al.* 2010).

Place-based connections have also proven to be useful in disaster management. For example, in the 2011 Queensland floods, local organisations helped provide effective support, because the community connections of these organisations mean that they are nimble, responsive and understand where and when help is most needed (Caniglia and Trotman 2011). Understanding these people–place connections can help develop innovative place-based industries.

These connections can be strained if people want to leave because of such things as dire employment prospects, or when infrastructure and services are lacking.

Infrastructure and services

Poor infrastructure and services such as roads, Internet, schools and medical facilities were identified by local business people (Survey 2017; Interviews 2017). A lack of services and poorly maintained services reduce liveability of these rural and remote regions (Kotey 2014). Services need to be demand driven, rather than supply driven (Stafford Smith *et al.* 2008) to ensure services meet local needs. Poorly designed services such as those transposed directly from urban areas may not necessarily be appropriate for remote locations; this is called '*isomorphic mimicry*' (Pritchett *et al.* 2010). Working with local people to understand local needs is essential to overcome these problems.

In CWQ, provision and maintenance of services are important for people in the region and also for people outside the region. CWQ is a strategic business hub servicing a much wider area of Australia. Long-haul transport use refueling and stop-over facilities in the region while delivering fresh produce from the Ord and Katherine regions of northern Australia to Brisbane and Sydney markets, through zoned corridors that permit multi-combination heavy vehicles (TMR 2018). People relocating between the north and south also use accommodation in CWQ (Interviews 2018). Additionally, CWQ is a strategic cattle-selling centre that forms an important link within the national supply chain (Higgins *et al.* 2013). Roads and transport services are used by individuals relocating to Darwin and by produce such as mangoes travelling to markets in southern Australia. Thus, the towns and small town-based businesses of CWQ are essential for maintaining infrastructure and services, which link trade, transport, tourism and travel between northern, eastern and southern Australia. Investment to maintain capacity in the towns of CWQ provides socioeconomic benefits well beyond the boundaries of the region; and benefits a far greater population than the local residents.

Positive consequences of providing services in drought-affected areas occur partly because of the high multiplier effects.

Recognition of this by government led to the establishment of the Drought Communities Program in 2015 to help fund infrastructure and provide employment in drought-affected regions (Australian Government 2017). The high multiplier effect of the government and health sectors means that financial support for these service sectors could have a greater impact than investment in the transport industry, which has a lower multiplier effect (Stoeckl *et al.* 2007).

However, there is a risk that short-term actions can undermine resilience unless longer-term and whole-of-community factors are considered (Phelps and Kelly 2019). The closing of government offices in many CWQ towns over the past 5 years seems to indicate a lack of understanding or empathy towards the characteristics of remote regional economies. The number of people leaving exacerbated the declining population, and causes various negative flow-on effects, such as lowering real estate prices. Phelps and Kelly (2019) argue that decisions about the provision of services need to ensure that public investment builds resilience. Public-sector investment is essential in remote regions, as are private investment and local initiatives to help foster innovation. Multiple coordinated actions are needed to help foster innovation and support remote regions, as no one strategy will be sufficient. Funding models are needed across Australia's rangelands, which provide stability and build confidence for investors (Chaney 2015), as an essential component of a systemic approach to building resilience (Stafford Smith and Cribb 2009).

Diverse and innovative economy

Many town-based small businesses in CWQ have embraced the need for diversification and innovation to counteract the downturn in agricultural industries and negative impacts of drought. Both innovation and diversification of town businesses are recognised as contributing to community resilience, as is the role of small businesses: 'The viability of small-medium size businesses is often regarded as a prerequisite for resilience in many rural areas' (Miles *et al.* 2007: 1).

Although economic and social decline is caused by drought (e.g. Fig. 4), droughts can also be a trigger for innovation. Both the literature (Schwarz and McRae-Williams 2009a) and this research note that business can be stimulated to 'do things differently' as a result of drought.

Some external funding is likely to be necessary to foster innovation. However, a warning should be noted about excessive assistance or subsidies reducing the capacity of local communities to self-organise. Welfare programs are recognised as necessary in times of drought, for small town businesses and not only for rural producers (Alston and Kent 2004; Drought Policy Review Expert Social Panel 2008). Nonetheless, government policy, especially drought policy, is frequently criticised for focusing on short-term assistance measures (Drought Policy Review Expert Social Panel 2008; Kerin and Botterill 2013). Long-term resilience-building programs are necessary to complement and balance short-term welfare assistance programs.

Changing institutional arrangements and governance structures is also recognised in our research and the literature (Martin-Breen and Anderies 2011; Walker *et al.* 2012) as vital to support and promote innovation and economic diversification.

Engaged governance

Good governance arrangements and collaborations that engage the local community are evident in CWQ. Some of the collaborative arrangements operating effectively are:

- The Remote Area Planning and Development Board (RAPAD) is built on collaboration between the seven local government areas in CWQ. RAPAD fosters joint projects, coordinates service delivery and regional advocacy (RAPAD 2017; Phelps and Kelly 2019) and has a successful record of partnering with local, state and federal government as well as community groups and private-sector businesses (Interview 20). This collaborative arrangement is heralded as a good model for other regions to follow (Walker *et al.* 2012: 20–21).
- The Central West Rural Wellness Network was set up during drought. This network has helped to foster collaboration between government departments and NGO groups, as well as to streamline mental health services (Interview 25).
- The Central West Hospital and Health Service has reorganised the provision of health services in CWQ. The undesirable practice of fly-in/fly-out doctors has been reduced, with initiatives such as the collaboration with the medical school at James Cook University, which is encouraging young doctors to build their careers in rural regions. The reorganisation of health services demonstrates that local people can develop local solutions, rather than centralised decision making (Interview 19).

Some CWQ small business owners discussed the need for greater collaboration, with comments such as:

- *‘More businesses need to work together – maybe we should start a Chamber of Commerce, so we can tackle future issues united, not alone’* (Survey 2017).
- *‘We are stronger if we hunt in a pack. We have great knowledge [in the community] and we need to share our knowledge with each other’* (Public meeting October 2017).

People in CWQ also complained about the demands of increased accountability, centralised decision-making, which fails to consult locally and frequent changes in policy. A common refrain from local people during this research was ‘Talk to the locals’; this is important to ensure that services meet local needs and are designed appropriately for local circumstances.

These issues are also highlighted in the literature and many are related to government services being outsourced and devolved to local government and other organisations (Walker *et al.* 2012). The local administration needs to have sufficient funding and skills to match the responsibilities it has been given. Transformative changes are needed; these could mean reversing the roles and responsibilities to allow for local people to define problems, identify solutions and manage local projects. For example for the last few years the Central West Rural Wellness Network coordinates all regional mental health programs, and this is working very well (Interviews 2018); reinforcing the idea that coordination is best done locally.

Flexibility to adapt to changing circumstances is necessary, especially as some changes can occur rapidly, such as flooding rain that breaks drought. Flexible systems also help account for differences within the region. Not all localities in CWQ are the same: *‘One size doesn’t fit all – particular regions respond to*

different ways. If you talk to the locals, you will understand what they want. It is so important to talk to the locals’ (Public meeting 2017). The diverse small communities in CWQ, each with distinct characteristics, are likely to need different actions to build resilience, and different models of governance.

Engaged governance revolves around collaborative approaches to regional decision-making (Maclean *et al.* 2014). Institutional reform is perhaps the greatest need in rural and remote areas of Australia (Walker *et al.* 2012). Social learning approaches (e.g. Brown and Lambert 2013) are effective in ensuring that the multiple perspectives are heard and integrated into strategic action. The high adaptability index of the Longreach area suggests that investment here will be well used. Building on existing arrangements with strong engaged governance, such as RAPAD, will be more effective and more cost efficient.

The disruptive factors associated with climate are likely to increase over time, and thus it is essential to consider how these communities can be resilient.

Recommendations to move ‘beyond the D.U.S.T.’

The findings of this research identify that decision-makers need to consider four options for providing support for town businesses and rural communities. Without support these communities will likely face increasing economic decline, population decline, health and social issues, and communities could disappear to the detriment of regional and overall socioeconomic resilience.

We propose the acronym D.U.S.T. as appropriate for a land that is so often dusty. The options for decision-makers are:

D. Decide to act.

U. Understand the context.

S. Support and develop local capacities and local institutions.

T. Transform regional governance.

Decision-makers can start anywhere in framework (Decide, Understand, Support, Transform) depending on their organisation’s mandate. Detailed guidelines for action are provided in the ‘Beyond the Dust’ report (Kelly 2018) commissioned by the Western Queensland Drought Committee. The framework D.U.S.T. highlights the key actions through which local communities can make decisions for their own region and remain resilient.

D = Decide to act

D.U.S.T. explicitly asks local decision-makers and governments to act. Commitment to act is often lacking in rural and remote regions, the rangelands of Australia, because of low political power related to the sparse populations in these areas. Long-term strategies to build resilience in rural communities does have benefits for governments, primarily by driving down costs as well as having greater effectiveness. Medical services have been transformed in CWQ, partly because improving local services was shown to save money for the Queensland Department of Health, as well as providing better health outcomes for individuals (Interviews 2018).

Governments need to understand the consequences of ‘doing nothing’. In CWQ doing nothing will likely mean that some small towns disappear. Many small towns already have low populations and very few businesses, which may mean these towns have reached a tipping point where continuing decline is likely. In locations where small towns are close together and

probably not providing essential services for residents or the surrounding graziers, governments may choose not to intervene. Despite the lack of financial support, some of these small towns have defied the odds for many years and continue to exist as community centres for the surrounding graziers.

The Australian government has agreed to enhance participation of small and medium enterprises (SME) in the national and global economy, and to promote entrepreneurship through building capacities as part of being a signatory to the 2018 'Declaration on Strengthening SME and Entrepreneurship' (OECD 2018). As such, a call to support town-based small businesses in CWQ is timely. Small businesses are integral to achieving resilient communities in CWQ and other rural and remote communities across the rangelands in Australia.

These communities often provide services for many outside their region. For example some CWQ towns are located on key transport routes, as explained by Phelps and Kelly (2019). These transport routes deliver produce and are also important for national security. People are needed in the rangelands to manage land for conservation reasons as well as agricultural production. Depopulating vast areas is unlikely to allow the natural environment to flourish, as weeds and feral animals need to be controlled.

People living in rural and remote communities are confronted by complex and interrelated challenges, yet they understand how to manage in highly variable systems. Planning the future together with these people is essential. Policies are needed to address the diversity of businesses, and non-farm economic activity is needed (OECD 2016a, 2016b). The principles of working with the locals, flexible and adaptive programs and equity have all been highlighted as essential by the research results and business-owner interviews within this paper.

Some actions developed from the analysis of the surveys, interviews, public meeting and the literature, suggest a few principles which need to underpin decision to act:

- Involve locals in planning before decisions are made;
- Ensure equity and social inclusion across all sectors of the community;
- Ensure flexible and adaptive frameworks.

Remote rural regions often have value to outside regions, with strategic assets and services such as catering for long-distance transport, maintaining bio-security for the nation, showcasing cultural and environmental tourism, providing defence infrastructure as well as agricultural production.

U = Understand the context

Gaining an understanding of the local context is essential to ensure any investment made is effective and efficient, as mentioned previously. As in most rangelands regions, CWQ is not homogenous – the towns and communities are diverse. The complexity of local contexts within remote regions is emphasised in this research (Kelly 2018; Phelps and Kelly 2019). Flexible arrangements are needed to respond to local contexts and foster innovation, as highlighted in the resilience literature (e.g. Bahadur 2016). Siloed or isolated disciplines, rigid organisations and limiting social norms can stifle innovation, and these issues need to be recognised.

Understanding the kinds of vulnerabilities that hinder the community's ability to change and cope with uncertainty is

important. A framework to explore vulnerability is outlined in a complementary paper by Phelps and Kelly (2019). Likewise, it is just as important to understand the existing assets or strengths of the community. OECD recommendations (2006) highlight the importance of strategic investments to develop the area's most productive activities. Building on existing knowledge, abilities and networks is a relatively simple concept yet so often ignored when 'experts' arrive to solve a community's problems for them. Integrating external expertise with local knowledge is more appropriate, thus valuing all sources of knowledge.

Having a reliable information base as well as understanding the context, in order to direct open and accountable decision-making, are critical first steps in building resilience. This information base can then be used to support and develop local capacities and local institutions, so they can take charge of their own futures.

Actions to facilitate understanding the localised context:

- Recognise the localised contexts within rural and remote regions;
- Examine people's connection to place and desire to build local businesses;
- Discover existing strengths, local capacities and knowledge, as well as vulnerabilities.

S = Support and develop local capacities and local institutions

Supporting local communities involves providing both financial assistance and expertise to develop the capacities of local people, local institutions and organisations. Building on local knowledge and capacities is more effective and efficient than building something completely new. Inconsistencies in government policy and implementation continue to hinder the support of local communities. On one hand the rhetoric calls for support for people suffering from drought and even encourages devolution of whole government departments to the bush. On the other hand, departments currently based in the remote areas have reduced staff, such as in CWQ in 2011 (Interviews 2018).

As discovered in this research, CWQ has a good foundation of networks and relationships across local businesses, community organisations and government agencies. Further investment to develop individual capacity is likely to be well utilised when targeted at local needs. Some capacity building as well as external funding is needed to support and further develop existing local institutions.

Actions to facilitate support and develop local capacities and organisations include:

- Provide financial support to existing community networks and local governance arrangements;
- Encourage stronger links between private, public, non-government organisations and civil society;
- Develop knowledge and skills through training, mentoring and coaching programs to meet local needs, in a locally appropriate manner.

T = Transform regional governance

Transformation is recognised as necessary to change the manner in which roles and responsibilities are assigned between state government and local organisations, both around the world (by

the Rockefeller Foundation, Bahadur 2016) and in Australia by Pew Charitable Trusts and others (e.g. Herbert-Cheshire 2000; Marshall and Stafford Smith 2010; Walker *et al.* 2012; Walker *et al.* 2012; Woinarski and Lewis 2017). Current governance structures in rural and remote regions are often frail and incapable of providing services that would be expected in more closely settled areas (Woinarski and Lewis 2017: 179). Nonetheless, local people in CWQ strongly expressed their desire to be involved in collaborative decision-making (Interviews 2017); and local collaborations in other rural and remote regions have proved effective (e.g. Herbert-Cheshire 2000; Walker *et al.* 2012). New integrated approaches are needed to support local arrangements, at the same time as implementing proactive strategies to increase coordination of sectoral policies within government (OECD 2016b).

Key changes required include first, breaking down traditional boundaries between organisations. Integration between sectors and across scales means local, state and national government working together with private enterprise and non-government organisations. Coordination of programs is often easier at the local scale, where people understand the context. The CWQ organisation, RAPAD, has been highlighted as one example of effective local governance (Walker *et al.* 2012), where collaboration across disciplinary and organisational boundaries and stakeholder support has delivered outcomes.

A second requirement is changing the power relationships between government and local organisations to allow greater local self-autonomy, which can reduce economic and political costs for state and national government. The transformation of medical services in CWQ highlights that cost savings can occur with appropriate local input. Reducing small scale funding in favour of larger blocks of investment will also reduce costs.

Third, governments need to continue to play a role by providing investment and guidelines in areas such as accountability. Helping to ensure that the goals of short-term programs to overcome vulnerability complement longer-term strategies to build community resilience is crucial. Some of the problems when this does not occur were highlighted during this research (Kelly 2018; Phelps and Kelly 2019).

Part of the reason that existing collaborative arrangements in CWQ have proved to be effective, is that CWQ has a high adaptability index (Productivity Commission 2017), high levels of volunteering (ABS 2017) and locals contribute significant local effort. All this means that investment is likely to have significant multiplier effect in these small communities. Also, recognising which sectors have the greater multiplier effects (Stoeckl *et al.* 2007) can help maximise investment. Greater local engagement and more collaboration between various levels of government, town and rural businesses and the community have the potential to build resilience, thereby supporting positive social and health outcomes, and strengthening regional and national economies.

Actions to help transform governance include:

- Changing roles and responsibilities to reduce centralised accountability and reporting;
- Encouraging new collaborative arrangements for local decision-making;
- Building stronger links between regions, and between remote and closely settled communities.

Helping to transform governance is a proactive measure that governments and other decision-makers can implement, in line with local people's requests highlighted during this research. When integrated interventions by government are coordinated at the local level as being done by RAPAD (2017) the efficiency and effectiveness will reduce public investment. A more collaborative governance approach, with strong local decision-making, is perhaps the greatest need in rural and remote areas.

This research builds a picture that reinforces the need for investment to build long-term resilience, not just as a basic human right but to contribute to the socioeconomic future of Australia. Such governance arrangements will help communities cope with inevitable change, including drought, as well as being more cost-effective.

Many of these actions will be relevant for any policy-makers or decision-makers wanting to work in dusty rural and remote regions of Australia, both during droughts and in good seasons when pro-active programs are needed. When decision-makers decide to act [D], this provides strategies to help them understand the local context [U], support local capacities and institutions [S] and transform arrangements towards collaborative local governance [T].

As highlighted in the literature, complex or wicked system problems need systemic approaches with multiple interventions (Stafford Smith and Cribb 2009; Brown *et al.* 2010). Starting with an understanding that communities have different perspectives, and as a result developing a suite of complementary, yet integrated programs will yield results. Social learning program operating around the world have proven this (Brown and Lambert 2013). No one strategy is appropriate for all of the different localised contexts but working with the local people to ascertain what is appropriate for their area is essential.

Conclusions – Building resilience in rural and remote regions

The perspectives of town-based small businesses in the CWQ region in Australia are likely to be relevant across many rural and remote regions in Australia, and perhaps in other rangeland areas around the world. The complex and nuanced economic and social interrelationships explored in this research for CWQ will have localised variations. However, understanding and working with the local context is critical if resilience is to be developed.

Resilience is considered to be at the cutting edge of regional development science. However, concepts related to vulnerability and transformation also need to be considered, for communities to be able to manage in the increasingly complex and unpredictable future. Simply doing more of the same and reinforcing the status quo will not be effective; certainly, such an approach will not be respectful of local people who hold such a wealth of knowledge about these remote areas of the world.

The framework developed as part of this research to help guide future decisions and policy reflects the often-dusty environment:

D. Decide to act

U. Understand the context

S. Support and develop local capacities and local institutions

T. Transform regional governance.

The suggestions for appropriate responses are built on the evidence base from CWQ towns but focus on a whole-of-community approach to building resilience across the region.

Town-based small businesses are an important component of regional economies and provide vitally important social capital. The issues of declining turnover and dwindling population of town communities are exacerbated by drought. As part of the highly variable climate, drought is a destabilising factor that overlays all other global and national trends, such as declining rural population and decreasing terms of trade. The decision to act and work with these town businesses and communities needs to occur before they reach a tipping point where recovery is unlikely.

Government policies need to focus on long-term strategies such as building resilience, as well as providing short-term welfare assistance when people are in dire need. Current policies are criticised for being both reactive (responding to, rather than preventing impact), and inequitable (providing support for grazing enterprises and not town-based small businesses). Support for all small businesses is essential if the region is to remain economically and socially sustainable. Despite these inequities and the lack of political will to intervene, several town businesses in CWQ have developed innovative strategies to enable them to survive.

The innovative governance arrangements operating in CWQ highlight ways that other rural and remote regions may be able to foster private, public and civil society partnerships. Celebrating the diversity of interests in these rural and remote communities allows people to build on their strengths. Collaborative partnerships do help to build resilience and adaptability. These positive stories need to be told and shared. Many rural and remote rangelands regions around the world are under increasing pressure from various factors, related to drought and uncertain weather patterns.

This CWQ case study suggests that transformative engaged governance approaches are likely to save governments money as well as supporting rural and remote communities. Applying the D.U.S.T framework could guide decision-makers' actions to help build more resilient rangeland communities, ensuring the survival of these rural towns, small businesses and the people who depend on them.

Conflicts of Interest

The authors declare a potential conflict of interest, as Dana Kelly was employed by the Western Queensland Drought Committee, and David Phelps is the Chair of the Western Queensland Drought Committee.

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Overcoming drought vulnerability in rangeland communities: lessons from central-western Queensland

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Abstract. Drought and climate variability are an increasing global problem, especially in rangelands which may lack robust socioeconomic systems. Vulnerability is being applied in drought and climate change policy theory, by describing exposure and sensitivity factors, and adaptive capacity. In this paper we examine these vulnerability factors in central-western Queensland (CWQ), Australia, as a case study to test the idea that vulnerability and resilience must be considered together to build strong and enduring rangeland communities. The region's economy and employment are strongly coupled with rain-fed agriculture. Drought is a key risk to CWQ communities, with 13 extended droughts recorded since 1898. The region has been officially in drought since 2013 following well below-average rainfall, and remains in drought in 2019. The impact has led to reductions in town business turnover of 30–60%, loss of livelihoods and outmigration of 20%. Outmigration corresponds to the recent periods of drought. Social networks have been destabilised, highlighting that the cascading impacts of drought are complex, interrelated and affect the whole community. Regionally led responses have helped to re-build social cohesion, provide mental health support and stimulate economic activity and employment. These actions provide examples of a systemic, whole-of-community approach, that (1) captures place-based advantages; (2) enhances internal and external socioeconomic networks; (3) engages meaningfully through multi-level consultation; and (4) seeks to build sustained financial investment. A common theme of success is partnerships which provide external support for regionally-identified issues and solutions. There has been considerable investment of public, philanthropic and private funds in drought relief and infrastructure programs. This has occurred through a whole-of-community approach, and suggests a move towards policy which aims to build long-term regional resilience. CWQ has linked vulnerability and resilience by asking of both internally and externally led drought relief 'will this action build or undermine community resilience'. This approach could also be applied to the design of drought policies and responses in other rangeland regions.

Additional keywords: adaptation, pastoralist, resilience, regional policy, rural communities, small business.

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Introduction

Drought in rangeland environments can be prolonged and extreme, severely impacting on productivity and livelihoods (Wilhite 2000). A large proportion of the global rangelands are arid and semiarid, with low and variable rainfall which is often coupled with persistently high evaporation (Asadi Zarch *et al.* 2015). Drought is defined in many ways according to meteorological, hydrological, agricultural, industrial and socioeconomic parameters (Botterill and Fisher 2003; Wilhite *et al.* 2014) and there is a lack of international consistency (Botterill 2003; Wilhite *et al.* 2007). In this paper we adopt the definition of drought that has been standardised in Queensland research and extension services since 1991 where: severe drought is the driest 5% of calendar years; and moderate drought is the second driest 5% of calendar years (Clarkson and Owens 1991). This is consistent with the national Australian definition that drought represents the lowest 10% of rainfall years (BoM 2018).

The impact of drought varies across the world. Within nations dominated by subsistence agriculture, the lack of rainfall, water and impacts on agricultural production can be catastrophic – leading to the displacement of large numbers of people, refugee crises, famine, civil unrest and war (UNDP/UNSO 2000; ISDR 2007; CARE International 2017). Where market production agriculture prevails, drought in rangeland regions is more often associated with economic downturn, business closures, reduced labour markets, population outmigration, physical and mental health issues relating to poverty and distress and the erosion of services and human capital as impacts cascade through as socioeconomic drought (Edwards *et al.* 2015, 2009; Fritze *et al.* 2008).

Land degradation events often follow prolonged and severe drought (McKeon *et al.* 2004; Stafford Smith *et al.* 2007), leading to reduced regional agricultural productivity, reduced economic activity and reduced employment opportunities over long time

spans (Olston 2008; Productivity Commission 2017a, 2017b). The resultant loss of rangeland population and settlements is common to many OECD countries (Maru *et al.* 2007; Hospers and Reverda 2014).

Within Australia's rangelands, farm populations are low and dispersed, and most towns are small (Maru and Chewings 2008). These towns tend to have strong, or highly clustered, social networks (McAllister *et al.* 2008) through shared family ties, bonds of friendship and community services that contribute to a region's social capital (Besser 2009). Australia's drought policy moved towards a risk management approach in the early 1990s (Botterill and Wilhite 2005; Stone 2014), with a focus on enhancing farm productivity and farm business preparedness for drought. However, rural socioeconomic systems are also disrupted through drought (Botterill 2003), and yet the towns and communities that provide labour, services and social connectivity to the agricultural industries are generally not included in policy approaches. Australia's Productivity Commission (2017a, p. 113) recommended that, even though 'population decline and the loss of services affects the people remaining in these communities', government should not intervene to prevent the loss of small rural towns. Such policy creates strong tensions with the residents of smaller towns who have financial, intellectual and emotional investment in their local communities (Argent 2008; Sartore *et al.* 2008). It is also at odds with high productivity in many regions representing untapped economic potential (RAI 2017). It may be inevitable that changing circumstances will continue to lead to the concentration of economic activity and population into regional centres, but the residents of smaller towns would argue that this does not have to be at the expense of their own community; many tiny communities (e.g. Ilfracombe, Forrest 2003) have defied economic logic and survived. However, successive droughts inevitably increase the vulnerability of these towns and communities.

Low and declining populations contribute to rangeland communities being vulnerable to droughts, yet strong social capital and community networks help sustain these remote regions (Maru *et al.* 2014). Responses to drought are often 'crisis-driven', so fail to account for local socioeconomic characteristics, and result in short-term responses undermining long-term resilience, often in ways that may be apparent only to local residents. Focusing on short-term fixes without considering long-term effects leads to ineffective and inefficient investment of the public, private and charity funds mobilised to address the immediate issue.

A vulnerability framework (Kasperson *et al.* 2005; Adger 2006; Fussel 2007) has been proposed as a way of mitigating climate risks (IPCC 2014). Vulnerability is being used to assess the risks in drought-exposed regions around the world (Wilhite *et al.* 2007; Wilhite *et al.* 2014), such as north-eastern Brazil (de Assis de Souza Filho *et al.* 2016). This approach is emerging as a useful guide for governments and non-government aid organisations to prioritise investment.

Maru *et al.* (2014, p. 337) presented a linked vulnerability and resilience approach, recognising that 'people in remote regions demonstrate significant resilience to climate. . . variability' while paradoxically being 'chronically disadvantaged and therefore. . . among the most vulnerable to climate change impacts'.

They hypothesised that focusing on short-term responses risks leading to greater longer-term vulnerability (Maru *et al.* 2014).

In this paper we aim to build on this theme by exploring the idea that vulnerability and resilience must be considered together to build strong and enduring rangeland communities. A case study in central-western Queensland (CWQ) tests the utility of a regional vulnerability framework (Kasperson *et al.* 2005; Adger 2006; Fussel 2007) and to consider the implications of short-term drought relief actions on longer-term resilience. Evidence is provided through a lens of lived experience using quantitative and qualitative social research, drawing on regionally-relevant reports and media articles, and theory from peer reviewed articles relevant to regional vulnerability and resilience.

Defining vulnerability and resilience

Vulnerability and resilience are often seen as opposites, rather than complementary concepts in a systemic framework, as highlighted by Maru and colleagues (2014). Responses to address vulnerabilities are generally shorter-term, while building towards resilience tends to take a longer-term perspective. An integrated and coordinated approach is required to both overcome vulnerability factors and build resilience.

Vulnerability

Although a rich multidisciplinary literature on vulnerability of people to hazards has existed since the 1980s (Cutter *et al.* 2009), vulnerability is a relatively new concept in the climate change and drought literature. A framework to assess vulnerability of any kind can be applied at a regional level, where communities, towns, and local government areas (LGAs) share similar issues and constraints. The scale of profiling should accommodate both local and regional vulnerabilities, as identified by their communities.

The Intergovernmental Panel on Climate Change (IPCC) defines vulnerability as 'the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity' (McCarthy *et al.* 2001, p. 995), which is pertinent to drought as one key attribute of a changing climate. This framework helps to profile their exposure and sensitivity to drought, and the adaptive capacity to build resilience.

The key elements of IPCC (2014) defined vulnerability are:

- (1) exposure factors – the extent to which the population and socioeconomic systems are exposed to external risks which cannot be controlled, such as the frequency and duration of drought, or volatile overseas markets;
- (2) sensitivity factors – the internal elements within a region which it can influence through adaptive actions. Sensitivity factors can mediate or exacerbate the impact of drought on the socioeconomic system. Sensitivity is characterised by technology and regional activities, such as a narrow regional economic base strongly dependent on rainfall, limited and poor planning around water security or economic contingencies, lack of alternative incomes, or marginalised populations. Sensitivity can vary according to

the magnitude, frequency, duration and extent of the hazard; and

- (3) adaptive capacity – the capacity of human capital and governance systems to maintain livelihoods, services and basic human rights during drought. Adaptation is the ability of socioeconomic systems to evolve in order to accommodate environmental hazards or policy change and to expand the range of variability with which it can cope. Adaptive capacity is strongly influenced by the build-up or erosion of the elements of social-ecological resilience (McCarthy *et al.* 2001; Adger 2006; Bhattacharya and Das 2007).

Identification of the exposure and sensitivity factors and the proposed adaptations need to be developed in consultation with local communities (Kasperson *et al.* 2005; Adger 2006). As such, this framework provides a systematic approach for local or regional governance groups to develop drought plans which account for the key elements necessary to overcome vulnerabilities and build resilience.

Resilience

Resilience is the ‘capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation’ (IPCC 2014, p. 5). We apply this definition in this paper to include the ambitions of a community to adapt and transform, progressing towards socially desired goals and values, similar to Maru *et al.*'s (2014) interpretation. Such a definition is appropriate in CWQ where the community has indicated a strong desire for improvement and adaptation rather than returning to the same pre-drought socioeconomic system (Kelly and Phelps 2019). In practice, resilience converges with vulnerability theory through on-ground actions. Vulnerability is often overcome with short-term actions, whereas resilience requires longer-term strategies, and these need to be complementary.

Linking vulnerability and resilience

In this we paper present a conceptual flowchart (Fig. 1) with a lack of rainfall initiating drought, with cascading effects through the three vulnerability theory elements of exposure factors, sensitivity factors, and adaptive capacity (IPCC 2014) – with a feedback loop of actions that reduce or increase longer-term resilience.

Regional exposure factors are ultimately expressed as socioeconomic impacts such as the loss of livelihoods and outmigration (Kelly and Phelps 2019). The severity of these impacts are moderated or intensified by the current sensitivity factors. The initial adaptive capacity of the region, which is embedded in the vulnerability elements of social capital, governance and livelihoods, then defines the drought response. A region with strong adaptive capacity may be more likely to choose and direct short-term actions to overcome vulnerability which also build resilience. A region with weak adaptive capacity may accept drought assistance regardless of the longer-term implications. This is represented as a feedback loop which reduces or exacerbates the region's sensitivity factors, further

moderates or intensifies the socioeconomic impact and ultimately builds or erodes resilience. This feedback loop has a strong corollary with the linked pathway of Maru *et al.* (2014), where vulnerability leads to reduced adaptive capacity and resilience builds adaptive capacity. Our conceptual pathway differs in being embedded within a vulnerability framework aligned with the global IPCC (2014) approach, and specifically applied to drought.

Adaptation to drought, degradation or other environmental challenges is most successful when locally identified solutions are supported by external actions implemented through strong partnerships. This is the most crucial step in the survival or collapse of civilisations at the global scale (Diamond 2005). This paper draws inspiration from this global view in exploring how both local/internal and external actions during drought can contribute to – or detract from – sensitivity factors and the resultant socioeconomic impacts. This is represented as the feedback loop within Fig. 1, and stimulates the simple question: ‘will this drought relief action undermine or build resilience in the locality and region where it is delivered?’

Critically, this question highlights the incompatibility of some short-term strategies to overcome vulnerability with long-term strategies to build resilience, for example, providing externally-donated goods for free, rather than purchasing locally for distribution. We explore how actions which focus solely on the short-term and address the current drought event in isolation are unlikely to improve resilience for future droughts, whereas those that focus on both the immediate needs as well as reducing sensitivity – such as through technological advancement to build resilience of current industries or to improve people's livelihoods – are much more likely to enhance regional resilience.

Profiling vulnerability in CWQ

As an example of the information useful to a regional vulnerability profile, the geography, current and historic socioeconomic activities and climate of CWQ are described. Then the vulnerability factors of exposure, sensitivity and adaptive capacity are described and linked to drought. Together, these provide a potential template to develop regional vulnerability profiles in other areas.

Background and European settlement

The case study region of CWQ straddles the Tropic of Capricorn in northern Australia. It starts 450 km inland from Queensland's coast and stretches 900 km further west until it reaches the Northern Territory border (Fig. 3). CWQ is within a semiarid to arid zone. Native vegetation ranges from tree and shrub-lands to open grassland which support extensive livestock grazing (Burrows *et al.* 1998) on family and (some) corporate farms. Pastoralism is the dominant land use, and land tenure is classed as leasehold (where crown land is leased on a long-term basis for commercial pastoral activities). The region is sparsely populated and classified as very remote (Kelly 2018). The largest town and regional centre is Longreach with a current population of 3000 residents (QGSO 2018a). The region includes the LGAs of Boulia, Winton, Longreach, Barcaldine, Tambo-Blackall and Barcoo, which coordinate service delivery and regional

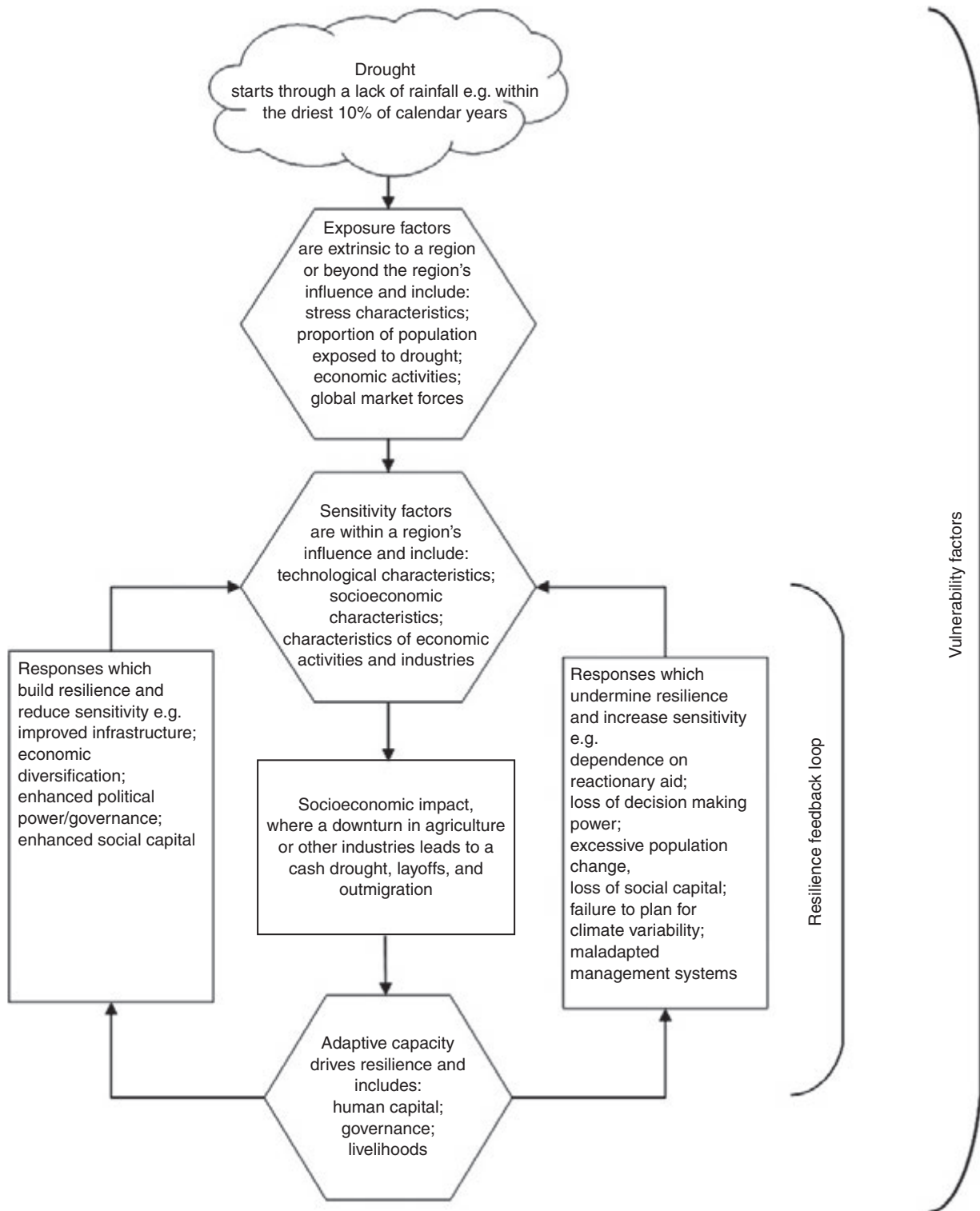


Fig. 1. Conceptual framework of drought, which starts through a lack of rainfall, with the extent of resulting socioeconomic impacts depending on the vulnerability factors of exposure, sensitivity and adaptive capacity. Subsequent socioeconomic impacts can be alleviated through responses that build resilience, or exacerbated by responses that undermine resilience within a feedback loop.

advocacy through the Remote Area Planning and Development Board (RAPAD) established in 1992 (RAPAD 2017).

European settlement grew quickly after the 1880s following the discovery of aquifers of reliable ground water (the Great Artesian Basin) in the early 1900s (Pegler *et al.* 2002), which allowed for large areas of native pastures to be grazed. Linked to this settlement were manufacturing industries and in Longreach these included a Cobb & Co. coach factory, Model-T automotive assembly, Qantas aeronautical factory, soft drink and beer breweries, and market gardening (Moffat 1987).

The region was perhaps at its richest during the wool boom of the 1950s, dominated by wool producing Merino sheep. Since the mid-1990s, sheep numbers declined due to poor commodity prices and reduced lambing rates through wild-dog predation and cattle numbers increased. Wool requires high labour inputs, and declining production led to reduced employment opportunities and greater exposure to more variable beef prices (Perkins 2013). The wool scours (processing factories) and sheep shearing services created employment for 200–300 residents in Longreach alone; and this population supported a school, shops, hotels and housing (Moffat 1987). The last of the wool scours was closed in the 1960s leading to further loss of livelihoods and outmigration (Forrest 2003).

Over the last 50–70 years, declining local industry and employment opportunities as well as improved technology has led to lower population in CWQ, a common story across agriculturally dependent regions in Australia (BITRE 2014; Productivity Commission 2017b). Overall, the regional economy – particularly the agricultural industries – is less diverse today than in was in the past. This translates into greater exposure to the key hazard of drought, with an over reliance on beef production.

The region's current economy and employment are still strongly coupled with rain-fed agriculture, accounting for 45% of town-based business activity and 26% of employment (QGSO 2018b). Pastoralists utilise services within their local towns for both business and personal needs, which in turn creates socioeconomic networks (Kelly 2018). Grazing of beef cattle (predominantly *Bos indicus* breeds) dominates a pastoral industry, followed by Merino sheep for wool production. Smaller agricultural industries within the region include sheep meat, the regulated wild harvest of kangaroos and goat production. The local value for beef cattle sales from CWQ was \$614.6 million from July 2016 to June 2017 (the Australian financial year), and wool was \$24 million (ABS 2017). There were 1.1 million head of cattle (MLA 2017a) and 485 000 sheep (MLA 2017b), which accounts for ~4% of the Australian cattle herd and less than 1% of the Australian sheep herd (MLA 2017a, 2017b).

The region is thus intrinsically exposed to factors that impact pastoralism. Drought is a key hazard not only to agricultural production, but also to the socioeconomic systems in towns and communities.

Drought and climatic variability

Like most semiarid to arid rangeland environments, CWQ experiences a high level of rainfall variability. For example, Longreach experienced 13 droughts of at least 24 months duration between 1898 and 2018 (Fig. 2). The severity of each

drought can be assessed using a 24-month moving window analysis, where the window is advanced one month at a time to determine the proportion of months within the 5th percentile of rainfall for the duration of each drought (Clarkson and Owens 1991). In the analysis, drought ceases once the rainfall exceeds the 10th percentile (Clewett 2005).

For Longreach, the most severe drought was August 2012 to May 2016 (Fig. 2). Well above-average winter rain between June and September 2016 provided relief, with conditions returning towards drought by February 2017 (Clewett 2005).

The Queensland Government officially declares drought for each LGA based on rainfall, on-ground pasture and water availability as advised by local drought committees. CWQ has been progressively drought declared since 2013 following well below-average rainfall (Long Paddock 2017a, 2017b) and remained drought declared in 2019 (Long Paddock 2019). The outlook is for continued below-average rainfall conditions (BoM 2019). Rainfall variability is expected to increase for CWQ under the majority of climate change scenarios (Stokes and Howden 2010), increasing the region's exposure to drought.

Rainfall across CWQ is summer dominant and high temperatures result in soil moisture loss through high evaporation rates and reduced potential pasture growth. In many areas infertile soils further constrain pasture growth. The resulting variability in pasture growth is extremely high and increases towards the south-west where it reaches a coefficient of variation of 1.5–2.0 (Fig. 3). This magnifies the exposure of pasture-based grazing businesses to drought, and of the risk to cascading socioeconomic impacts across the region.

Exposure factors in CWQ

The exposure factors for CWQ are summarised from official sources (e.g. OQTA 2018; QGSO 2018a, 2018b), lived experience and local knowledge in Table 1. The CWQ example could be used as a template for other rangeland regions to summarise their exposure factors and for prioritising actions to reduce sensitivity, improve adaptive capacity and thus build resilience.

Exposure factors reflect current socioeconomic conditions, based on stress characteristics, the population and the economic activities of the region. They will have developed over time as described in the previous section but can be mitigated (in the longer term) by policy designed outside the region or by activities developed within the region. The next section describes how communities are strongly linked to drought, and indicates other external factors which can influence exposure and exacerbate the impacts of drought.

Exposure to drought

Exposure discussed in this paper is characterised by the risk, frequency and duration of drought. Risks are high for pastoral enterprises, through the high frequency of drought. All pastoral businesses are exposed to periods of pasture shortages, with additional costs associated with feeding high value sheep and cattle as well as risks involved with selling livestock into oversupplied markets during drought. Other agricultural enterprises in the kangaroo and goat industries are similarly affected (Grigg 1987; Chapman 2003; Ampt and Baumber

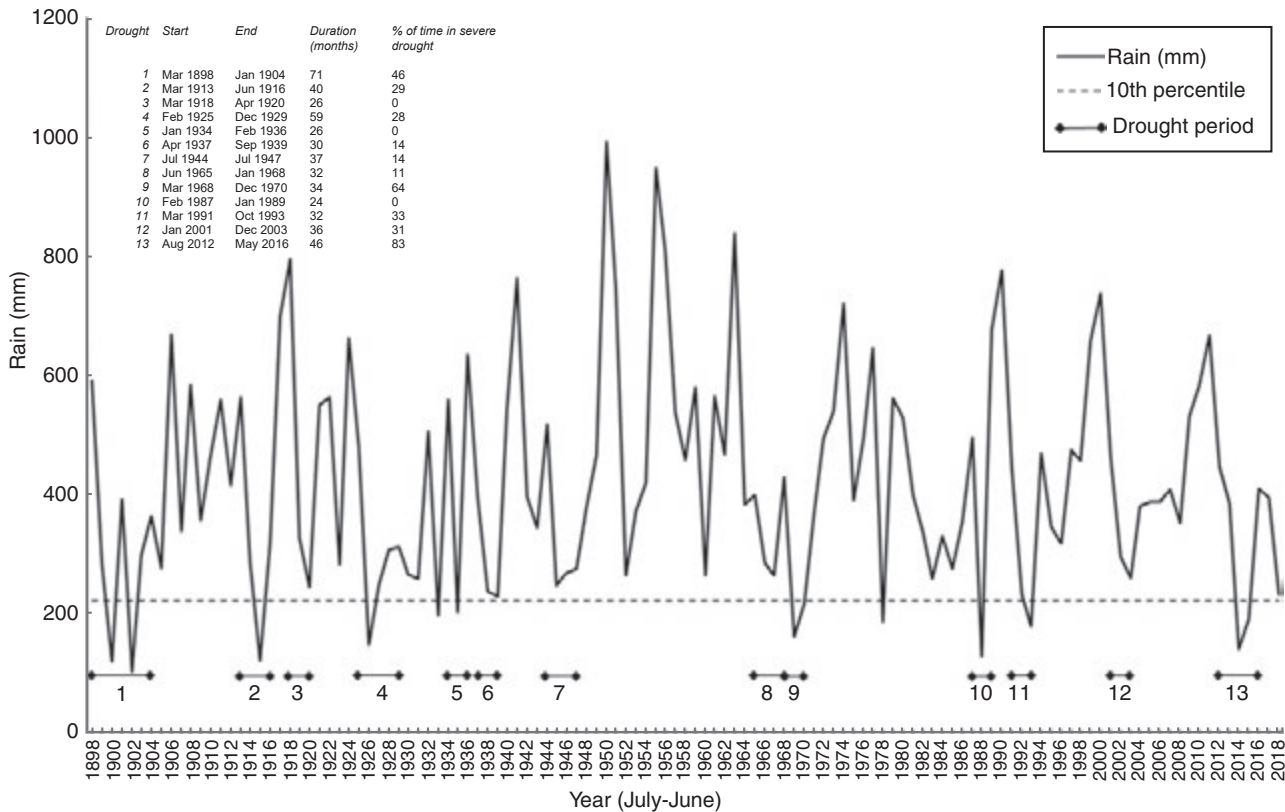


Fig. 2. Historic rainfall patterns and incidence of extended drought periods for Longreach, in central-western Queensland (Clewett 2005).

2006). This high exposure to the risk of suboptimal production or failure in agricultural systems in CWQ, leads to extremely variable cash flow (Drought Policy Review Expert Social Panel 2008). For example, the value of agricultural commodities produced in the Longreach region was \$84.6 million in the 2010–2011 financial year, before the current drought, yet only \$38.2 million in 2015–2016 (ABS 2017). The cascading effects of exposure to drought for communities are substantial (Kelly *et al.* 2017; Kelly 2018; Kelly and Phelps 2019).

This ‘cash-drought’ of the current drought (2012–2019) has led to a severe downturn in town economies with reduced town business turnover of 30–60% in Longreach, the region’s largest town (Kelly 2018). These mainly family run businesses are already facing structural challenges through increasing input costs such as electricity (Kelly 2018). The resulting domino effect saw local employment opportunities evaporate, unemployment rise and families begin to leave, seeking employment elsewhere.

Employment opportunities in CWQ are primarily dependent on the pastoral sector (e.g. farm manager positions) or indirectly dependent through secondary town service jobs (e.g. contract labour such as shearers, musterers, fencers) which rely on economic activity in the pastoral sector (details in Kelly and Phelps 2019). Although not to the same extent as agriculture, other employment is provided within health, education, construction and tourism (see details in work by Kelly and Phelps 2019), e.g. the accommodation and food service industries employ only 6% of the population (QGSO 2018b). These activities are largely decoupled from the impacts of drought.

Public sector services are indirectly linked to the risks of drought, as services are generally tied to the size of the population. With population out-migration the demand for services declines, the number of support staff (e.g. teachers) invariably declines as well (Kelly 2018).

The total out-migration from CWQ between 2011 and 2016 was 2250 individuals, ~20% of the population (see fig. 3 in Kelly and Phelps 2019). By 2016, 30% of all houses in Longreach were vacant and for sale or rent. School enrolments declined by 19% (Kelly 2018) and many social and sporting clubs struggled to maintain support (see Kelly and Phelps 2019). The cascading impacts of drought are interrelated and complex, not only affecting agricultural industries, but impacting the whole community.

Exposure to factors other than drought

In addition to drought, Australian beef and wool producers are exposed to multiple external factors outside their control (e.g. global and domestic beef prices). For example, most beef and wool is exported and the prices received are exposed to changes in exchange rates between major trade partners, to trade barriers, to declining terms of trade, and to market volatility (Browne *et al.* 2013; Ash *et al.* 2015). Other agricultural industries are also affected, such as the kangaroo industry which is exposed to a high risk of market suspension through trade barriers (Mawson 2010) or lobbying from conservation and welfare groups (Hamilton-Smith 2018).

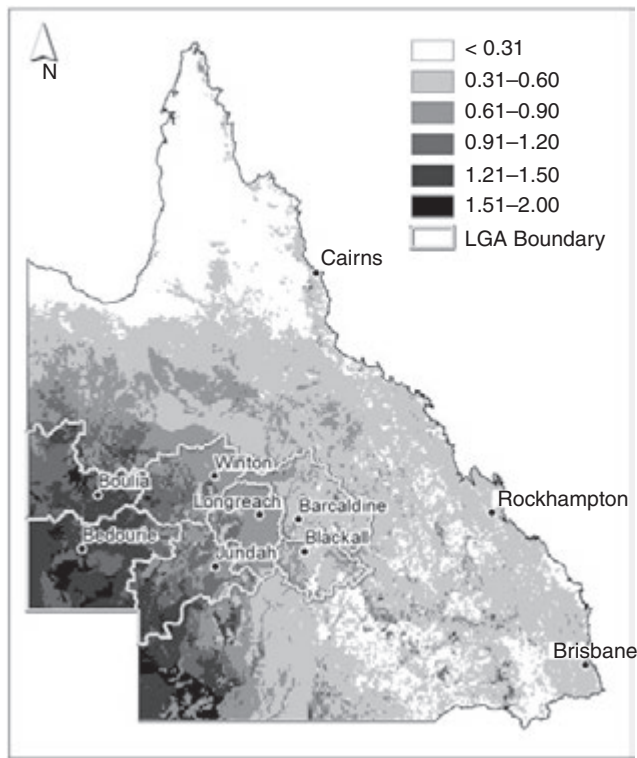


Fig. 3. Coefficient of variation of annual pasture growth in Queensland (shaded categories). The central-western Queensland (CWQ) local government areas (LGA) that comprise this case study, and their administrative centres, are indicated. Data source: Queensland agricultural land audit (Agriculture and Fisheries 2018a, 2018b).

The broader context of socioeconomic activities is also important, and the way in which these interact with drought. For example, grazing businesses would normally increase financial reserves during a series of higher rainfall years. In the lead up to the current drought several factors such as an oversupply of cattle across northern Australia (Perkins 2013) led to poor cattle prices. This prevented savings and debt levels increased quickly as the drought progressed (AgForce 2015; QRIDA 2017). The north Australian beef industry also has constraints to viability e.g. due to high input costs, which need to be addressed through policy, research and extension services and capacity building (Hunt *et al.* 2014; Holmes and McLean 2017).

Remoteness is a key exposure factor limiting population growth. Rangeland towns are often perceived as less desirable locations to relocate to by city and coastal residents, for example due to the long distances (>500 km) to urban services.

These factors are very interrelated with complex cascading effects (see fig. 4 in Kelly and Phelps 2019), it is impossible to determine the relative impact of any individual factor, such as drought. These additional exposure factors also need to be considered when describing the region's sensitivity factors and options to build resilience.

Sensitivity factors

Sensitivity factors are those able to be mitigated by technology (e.g. infrastructure and telecommunications to support the

socioeconomic system) and regional activities (pastoralism, public services, construction, tourism and minor agricultural industries) to buffer against the exposure to drought. In CWQ, sensitivity to drought is high. We conceptualise (Fig. 1) that sensitivity is strongly influenced by the short-term actions taken during drought, for example, responses that build long-term resilience also reduce short-term sensitivity.

As highlighted earlier, diversification is lower in the 2000s than it was in previous decades. Employment opportunities are limited, and certainly decline further during periods of drought. The population of CWQ is sensitive to the impacts of drought as a high proportion (28.1%) of residents classified as 'most disadvantaged', compared with only 18.4% in eastern Queensland (QGSO 2018a). Reflecting this, education levels are relatively low, with 46% of residents having completed year 11 or 12, compared with 60% for eastern Queensland (QGSO 2018a). Although there is limited access to tertiary education in the region, Longreach State High School has won numerous awards and recognition for excellence in academic and trade traineeship (Harris 2011; Queensland Government 2017) and the Rotary Club of Longreach have provided youth training opportunities to build community leadership. These are some examples of the local community's adaptive capacity.

Adaptive capacity

Adaptive capacity is the ability to maintain livelihoods, services and basic human rights – in this context during drought. It is characterised by high human capital and robust governance systems, and is determined by how well individuals, groups and industries respond to droughts, volatile markets or other stress factors. This section explores the adaptive capacity of CWQ, emerging and potential industries that can contribute to resilience and describes the effect of existing policies and actions during the 2012–2019 drought on resilience within CWQ.

CWQ has demonstrated capacity to recover from drought and extreme events since at least the 1960s. This suggests the region is capable of mitigating the socioeconomic impacts of drought by concentrating on responses which address sensitivity factors and build resilience. In the early 1900s the pastoral industry and some towns (e.g. Winton, Barcaldine and Blackall) mitigated risks through the sinking of bores to access good quality underground water in the Great Artesian Basin (Pegler *et al.* 2002). In the past 12 months, local governments have boosted supply to regional towns with further bores.

Adaptive capacity is also demonstrated by visionary community leaders who fostered the local tourism industry in CWQ following the 1960s drought (Moffat 1987). The early rural history of the region has been highlighted at museums such as the Stockman's Hall of Fame (celebrating Australian rangeland pioneers) and the Qantas Founders Museum (a tribute to the origins of Australia's international airline). Such attractions provide reasons for tourists to stay longer, and in 2004 such tourism activity added \$136 per person per day to the local economy (Greiner *et al.* 2004).

Outback tourism now makes a strong contribution to the regional economy; growing at a rate of 9.5% per annum, with a record 886 000 visitors to the outback in 2017 and a total value of \$573 million (Tourism and Events Queensland 2017). This is

Table 1. The drought vulnerability profile of central-western Queensland, based on describing: exposure factors (stress characteristics, degree of exposure of the population and economic activities); sensitivity factors (socioeconomic, technological and economic activity characteristics); and adaptive capacity (human capacity, governance and livelihoods) based on official sources (e.g. REMPLAN 2017; QGSO 2018a, 2018b; OQTA 2018), lived experience and local knowledge

Factor/Region	Central-western Queensland (CWQ) factors
	<i>Exposure factors</i>
Stress characteristics	Very high exposure: semi-arid to arid zone with high rainfall variability and increasing temperatures and evaporation; agricultural terms of trade continuing to decline; town economies dependent on agriculture and thus also exposed to declining terms of trade in addition to global business factors such as on-line shopping; relatively low and unstable population, where the loss of one family can lead to the closure of a local school and a domino effect of loss of services
Exposed population	Very high exposure: 60% living in very remote areas; relatively low public and private service availability, vulnerable to shocks such as out-migration or policy changes to service delivery based solely on micro-economic factors; relatively low levels of education; relatively low access to local tertiary education; high indigenous population disadvantaged by a number of factors; relatively low numbers of professional positions, career paths and external peer networks
Exposed activities	Very high exposure: 45% of all businesses directly involved in agriculture, and agriculture directly exposed to the high risk of meteorological drought, tempered by availability of underground water from the Great Artesian Basin
	<i>Sensitivity factors</i>
Socioeconomic characteristics	High sensitivity: 25.7% of regional population employed in agriculture; the population of the region has shrunk through the loss of the sheep and wool industry; minor economic benefit from the mining boom; reduced diversity in economic base over last 50 years (e.g. the loss of aeronautical and vehicle manufacturing and wool processing); high percentage of population disadvantaged through poor access to tertiary education, low median income and other factors
Technological characteristics	High sensitivity: poor telecommunications, <2% land mass covered by mobile network; slow rollout of the NBN; on-farm technology expensive, with strong desire to utilise new technology; in town access to technology and training expensive
Characteristics of the activities	Many factors lead to high on-farm sensitivity to drought: rain-fed pasture systems supporting grazing, with no option for mitigation through irrigation; feed substitution (e.g. hay) is expensive; reduced capacity to naturally rebuild herd/flock through breeding following forced sales in drought; high freight costs due to long-distances to market; low businesses skills a barrier to increased profitability in many instances Very high sensitivity in most town business: sales of goods and services highly dependent direct to farm business and non-essential during cash drought e.g. contract mustering, motorbikes, fencing materials, hair dressers; main street business high sensitivity with majority of sales to farm sector directly or indirectly e.g. groceries, fuel, but with less dependence during peak winter tourist season: global forces, such as on-line purchasing: tourism – transient population of visitors, high age and risk of non-return due to ill health; tourism – exposed to exchange rate (overseas may visit more if AUD low, but low AUD leads to more Australians travelling overseas instead of domestically): in-transit population with long-haul road transport, military and other through traffic
	<i>Adaptive capacity</i>
Human capacity	Despite a low and disadvantaged population, there is a very high adaptive capacity due to: incubator conditions which lead to commonplace innovation and self-reliance; social capacity (e.g. CWQ has twice the level of volunteering as the rest of Queensland); high levels of interconnectedness and trust On-farm adaptive capacity includes: a strong to moderate desire to prevent resource degradation; increasing ability to control total grazing pressure through exclusion fencing; increasing ability to exclude predators through fencing; experience through managing previous droughts

Table 1. (continued)

Factor/Region	Central-western Queensland (CWQ) factors
Governance	Currently high adaptive capacity, historically high with periods of lesser leadership: visionaries established tourism industry, brought electricity grid to region, agricultural training and research facilities; other periods where local leadership increased vulnerability e.g. closure of bore water system; current development of a drought mitigation plan for future resilience; off-set by poor political influence at State and Federal levels through low number of electoral seats based on low population
Livelihoods	Highly variable adaptive capacity, with above average wages and low unemployment, but a highly transient population of seasonal workers in both agriculture (e.g. contract shearers and musterers) and tourism (e.g. kitchen staff and tour guides), currently more vacancies in tourism sector than can be filled locally

similar to the value of agriculture during the drought, but much less than agriculture in the good years (change in turnover by industry sector is indicated in Fig. 2 in Kelly and Phelps 2019).

Tourism has provided opportunities for pastoralists and the region to diversify. One pastoral business which responded during the Millennium drought has expanded from a river cruise to include an outdoor show, cafe, a shop, a horse drawn coach trip, a farm stay and a cruise on an old paddle wheeler (Radio National 2015). Another has established an Outback Yacht Club in conjunction with a new tourist business on their sheep and cattle station (Radio National 2016a).

However, a successful tourism industry should not be taken for granted. The domestic tourism period is generally confined to the months of April–September (Kelly 2018) as southern based Australians seek warmer temperatures but avoid the hot temperatures of the summer. Domestic tourism is road-based and thus sensitive to fuel prices. There is a current skills shortage in tourism, which is expected to intensify as the industry continues to grow, exacerbated by high tourism business staff turnover (TRA 2015; QTIC 2017). In CWQ, retail trade and accommodation and food services each have ~40% part-time workers, compared with 10% within agriculture. Skills and other issues will need to be addressed for the outback tourism industry to continue to build the region's drought resilience.

An innovative partnership between James Cook University (JCU), the Mount Isa Centre for Rural and Remote Health and the Central West Hospital and Health Service has established a clinical teaching facility in Longreach (James Cook University 2016). This increases the capacity for JCU students to experience generalist medical training in CWQ (James Cook University 2018) and improves the retention rate of medical staff in rural and remote locations (Dolea *et al.* 2010). Aged care facilities in the major towns provide opportunities for elderly residents to stay and maintain social networks, and contribute to the retention of social capital (Kelly 2018), as well as economic capital through government pensions provided to older people. Adaptive capacity can sometimes make substantial change to the local systems.

An example of effective agricultural policy driving adaptation is the Farm Management Deposits (FMD) scheme. This scheme was established by the Australian Government to reduce risk and smooth farm income over time (Australian Government 2019). Its use has increased within Queensland's beef industry (QRIDA 2017), with money from cattle sales during drought set aside for re-purchasing livestock under improved seasonal conditions. Policies such as this scheme

create opportunities for industries to transform the way they operate, and could be applied to build community and regional resilience.

Transformative adaptation

Transformation (defined as 'a change in the fundamental attributes of natural and human systems' IPCC 2014) is an essential aspect of resilience (Walker *et al.* 2004; Bahadur 2016) and extends beyond current adaptive capacity. The Productivity Commission (2017a) highlighted the importance of diversifying the regional economic base to create jobs, grow the regional population and ensure long-term adaptive capacity. There are examples of innovations emerging in CWQ with the potential to transform the economic base and maintain livelihoods, services, basic human rights and building human capital.

Pastoralists, indigenous corporations and cooperatives have engaged in Australia's carbon economy, with 16 Emission Reduction Fund projects in CWQ as of early 2018 (ERF 2018). Total estimated earnings to date are approximately \$425 000 through the generation of 32 732 Australian carbon credit units (ACCUs). Each ACCU equals one tonne of carbon dioxide equivalent (tCO₂-e) stored or avoided by a project, and an assumed price of \$13/tCO₂-e. The potential exists for more carbon sequestration (Witt *et al.* 2011; Gowen and Bray 2016). However, other rangeland regions are expressing concerns over the risk of perverse outcomes from carbon projects, with the potential for large areas of land to be purchased by urban investors and disengagement of land from the pastoral industries. This could reduce employment opportunities, divert economic activity towards corporate owners and reduce regional resilience through reduced regional income and population outmigration (Cripps 2018a).

Large solar farms have been established in CWQ at Barcaldine and Longreach, with a total investment of approximately \$100 million (CEFC 2018; Vorrath 2018). The longer-term contribution to the regional economy or employment is uncertain, but in Longreach the construction phase provided 30 jobs over 6–9 months (Queensland Government 2018). The potential for solar, and other renewable (e.g. geothermal, wind and biofuel) energy generation industries across Australia's rangelands is vast and largely untapped (Pittock 2011). The sector could contribute significantly to the future CWQ economy.

Improved telecommunications could help grow new industries. Investment in innovations such as shire-wide Wi-Fi coverage has boosted agricultural technology uptake and

Table 2. Government, community and philanthropic responses during the 2012–19 drought in central-western Queensland and potential impact on vulnerability and resilience

Response	Short-term immediacy or long-term structural	Impact on vulnerability (sensitivity factors and adaptive capacity)	Impact on resilience
		<i>Farm business</i>	
Farm household assistance	Currently short-term, could transform to structural	Reduced short-term sensitivity; potentially longer-term dependency and reduced adaptive capacity	Currently dependent on individual business outcomes; Potential to increase if implementation encourages self-reliance
Low-interest rate loans	Both	Improved adaptive capacity when encouraging business growth	Dependent on individual business outcomes
Freight subsidy on stock movements	Short term	Encouraging early destocking to improve land condition will improve long-term adaptive capacity, whilst potentially reducing short-term cash flow	Dependent on policy implementation and individual business responses
Reduced cost of feed supplements for production (e.g. freight subsidies or donated lick blocks)	Short term	Reduced sensitivity when used to maintain animal productivity and not incentivising overgrazing of vulnerable pastures	Generally enhanced by maintaining animal productivity, welfare and farm income
Reduced cost of substitution feeds (e.g. freight subsidies or donated hay)	Short-term	Increased sensitivity when incentivising overgrazing of vulnerable pastures and eroding land condition; Decreased when incentivising destocking e.g. ensuring stock are in adequate condition for transport	Generally reduced through reduced land condition and reduced long-term carrying capacity; May be enhanced if promotes de-stocking (e.g. hay for stock in yards awaiting transport)
Donated goods and services	Short-term	Increased sensitivity if displacement or market distortion is sizable enough to impact on local business; Decreased adaptive capacity if leads to dependency over the long-term; or Improved adaptive capacity if donations allow business to re-build, or provides a mental-health boost	Generally reduced but dependent on level of displacement (e.g. one pallet of groceries to a small one-shop town c.f. a major centre); Goods which do not displace local business (e.g. e.g. luxury items with intrinsic personal value) may be neutral or possibly increase resilience through boost to mental health
Farm business advice, education and extension services	Both	Improved adaptive capacity through skills, knowledge and decision making	Generally enhanced but dependent on level of uptake and implementation
Co-investment in water infrastructure	Both	Improved adaptive capacity by enhancing land condition when used to spread grazing pressure more evenly across paddocks	Generally enhanced by improving grazing efficiency; Could be reduced if promotes over-grazing into previously inaccessible areas
Co-investment in wild-dog exclusion infrastructure	Both	Improved adaptive capacity by improving management and business options	Generally enhanced by enhancing animal production, reducing total grazing pressure and allowing implementation of pasture rest
Mental health service provision	Both	Improved adaptive capacity and decreased sensitivity for community and business	Generally enhanced by improving community resilience, business decision making capacity
Boarding school fee subsidy	Both	Decreased sensitivity for individual farm families by off-setting costs coupled with potentially improved adaptive capacity through education outcomes; Increased sensitivity for community through erosion of regional services (less students, less resources); Decreased adaptive capacity (potentially) through detaching younger generation from their community	Short-term increased to individual families; Potential improved community or business resilience if educated children return to the region; long-term decreased to community if local education standards decline, and boarding school educated children fail to return to the region
Farm Management Deposits (FMD)	Both	Decreased sensitivity by providing a financial instrument to manage variable seasonal income	Generally enhanced
5-year tax smoothing	Both	Decreased sensitivity by providing financial instrument to reduce cash-flow impediments	Generally enhanced

Table 2. (continued)

Response	Short-term immediacy or long-term structural	Impact on vulnerability (sensitivity factors and adaptive capacity)	Impact on resilience
Direct cash donations to farm families (e.g. Western Queensland Drought Appeal, Rotary drought fund, Aussie Helpers drought card, Drought Angels drought card)	Short-term	Decreased sensitivity through local purchase of essential goods and services, stimulation of local economy, can be ad-hoc or limited in extent depending on incoming donations	Generally enhanced through mental health, essential purchases, flow on to local town business and community
Direct bill payments on behalf of farm families (e.g. CWA drought fund)	Short-term	Decreased sensitivity through local purchase of essential goods and services; Some risk of creating dependency and undermining adaptability	Generally enhanced through mental health, essential purchases, flow on to local town business and community; Some risk to reducing adaptability
Donated Q-Fever vaccination program (Longreach Rotary and Qld Health)	Both	Decreased sensitivity by reducing risk to farm labour and management productivity	Generally enhanced
Town agricultural and 'main street' business Business advisory services	Both	Decreased sensitivity but currently ad-hoc or limited in extent or longevity	Generally enhanced with flow-on benefits to community (increased employment, improved services to town and farm)
Business practice improvement (education and extension services)	Both	Improved adaptive capacity but currently ad-hoc or limited in extent	Generally enhanced with flow-on benefits to community (increased employment, improved services to town and farm)
Direct donations to town-business families (e.g. Church collective, Western Queensland Drought Appeal, Australian Government hardship fund)	Short-term	Decreased sensitivity through local purchase of essential goods and services, stimulation of local economy	Generally enhanced through mental health boost, essential purchases
Co-invested support of agricultural businesses (e.g. Baptist Church and farm business co-funded rural contractors)	Both	Decreased sensitivity through local purchase of essential goods and services, stimulation of local economy	Generally enhanced with flow-on benefits to community (increased employment, improved services to town and farm)
Tourism development	Both	Decreased sensitivity and improved adaptive capacity, with the caveat that infrastructure and services need to be planned or high-transient population can drain local resources	Generally enhanced for town business and community, with some individual farms benefitting
Sponsorship of events	Short-term Potential for long-term if linked to specific outcomes e.g. mental or physical health	Decreased sensitivity if local purchase of essential goods and services; Potential for increased if displaces local goods and services	Generally enhanced
<i>Community</i>			
Drought specific grants (e.g. FRRR Tackling Tough Times Together)	Both	Decreased sensitivity and improved adaptive capacity	Generally enhanced through improved facilities, locally relevant projects and stimulating local economy and labour force
Philanthropic community service projects (e.g. Outback Links modernising of Longreach Show pavilion)	Short-term emphasis, with potential long-term benefits	Decreased sensitivity but can be ad-hoc	Generally enhanced through improved facilities and local purchase of goods, with the caveat that careful coordination is needed to reduce displacement of local business services
Community inclusiveness (e.g. pop-up movies in the paddock, drought relief concert tours, community BBQs by Rotary, Lions, CentaCare)	Short-term emphasis, with potential long-term benefits	Decreased sensitivity by maintaining social connections	Generally enhanced by uniting farm, agricultural and town communities

(Continued next page)

Table 2. (continued)

Response	Short-term immediacy or long-term structural	Impact on vulnerability (sensitivity factors and adaptive capacity)	Impact on resilience
Youth leadership programs (e.g. Longreach Rotary, Longreach Regional Council)	Both	Improved adaptive capacity but currently ad-hoc or limited in extent	Generally enhanced by expanding future leadership capability
Arts programs	Both	Improved adaptive capacity, decreased sensitivity by maintaining social connections	Generally enhanced for community
General health services	Both	Improved adaptive capacity	Generally enhanced by improving quality of life and working life-time, through direct economic benefits of employment and embedding professionals within community service groups
Local education services (primary and secondary)	Long-term	Improved adaptive capacity	Generally enhanced by increasing community knowledge, employment opportunities and innovative capacity, through direct economic benefits of employment and embedding professionals within community service groups
Local education services (tertiary)	Long-term	Improved adaptive capacity	Generally enhanced by increasing community knowledge, employment opportunities and innovative capacity, through direct economic benefits of employment and embedding professionals within community service groups

enhance tourism experiences (Cripps 2017). This represents regionally driven innovation to address a lack of access to mobile phone and internet services (Telstra 2018) and the desire to connect business globally (RAPAD 2018). Improved internet services delivered to farms by the ‘Sky Muster’ satellite in late 2016 (Francis 2016) has facilitated the development of off-farm income and diversification, for example into clothing manufacture, speciality meat supply, and on-line fitness coaching businesses (Cripps 2016; MacTaggart and Wee 2016; Radio National 2016b; Anon 2017; Walker 2017). Further communications advances will increase opportunities for farm and town based businesses to diversify into global markets and build drought resilience (Kandulu *et al.* 2012). These examples highlight current and emerging adaptive capacity through tourism growth, public–private partnerships, the use of technology in agriculture and governance.

A critical threshold for resilience

Recent reports by the Productivity Commission (2017a, 2017b) suggest the adaptive capacity across the region is variable and at risk of declining. Short-term actions can move a region away from – or closer to – a critical threshold for recovery during drought, but longer-term actions and trends can also increase or decrease the region’s resilience through sensitivity factors (Berkes *et al.* 2003; Walker *et al.* 2004). CWQ may be on the cusp of a critical threshold (Productivity Commission 2017a, 2017b), and actions taken during the current drought are of long-term importance. Overall, CWQ was ranked towards the top of a group of regions with below-average adaptive capacity, with

population decline a key concern (Productivity Commission 2017a). An initial finer scale analysis suggested that the Longreach Regional Council has above-average adaptive capacity (Productivity Commission 2017b). These results suggest variable adaptive capacity within the region with some towns improving while others declining, and the need to assist CWQ to improve its adaptive capacity.

There are no local data to gauge the adaptive capacity of the region at the onset of the current drought. Local lived experience provides some examples. In 2012, the Longreach Rotary Club had less than 15 members, weak links across the Rotary International network and a focus on localised community projects, for example, local fundraising for small hospital upgrades. There were regional examples of adaptation, with RAPAD and the Natural Resource Management group (Desert Channel Queensland) delivering innovative and highly regarded services across CWQ (Kelly 2018). In line with many Australian regions, local anecdotes suggested fundraising for organisations and community groups was increasingly difficult as the regional economy contracted rapidly during the drought conditions (Kelly 2018). These anecdotes broadly support the indication of a region on the cusp of dropping further down the rankings of poor adaptive capacity (Productivity Commission 2017a, 2017b), and suggests urgent transformation is needed to build resilience.

All investment should aim to build resilience

Building regional resilience for the future will require a combination of sustained policy measures and investment to reduce the exposure and sensitivity of CWQ to drought, climate

change and agricultural market volatility. It will be crucial to focus on investment that delivers long-term resilience, even when addressing short-term needs, and provides stability in resourcing and partnerships at local, regional, state and national levels (Kelly and Phelps 2019). The major economic activities of grazing beef, sheep and of tourism need to be strengthened through private and public investment and continuously striving for product excellence. Beef and wool price cycles are relatively independent (Grain and Graze 2018), and tourism is less sensitive to the impacts of drought than agriculture. However, the evidence from the current drought's socioeconomic impact suggests that existing industries are unlikely to moderate the impact of future droughts, and that the region needs a more diverse economic base to sustain livelihoods (Kelly 2018). Drought responses should build the adaptive capacity of the region to reduce vulnerability and improve future resilience. The ways in which short-term actions may build or erode resilience are explored in the next section.

Vulnerability and resilience links during the 2012–2019 drought

The ways in which the community responds, coupled with actions from outside the region, modifies sensitivity to current and future droughts. Resilience may thus be undermined or strengthened – perhaps even simultaneously – by the feedback of socioeconomic responses to drought into sensitivity factors (Fig. 1). This section explores the implications of intra-regional (lead or undertaken within CWQ) and extra-regional (brought into, or imposed upon, CWQ) short-term drought relief actions on longer-term resilience. An overview of actions that build versus erode CWQ resilience are provided in Table 2 and key examples are explored in the following sections.

Intra-regional actions

The CWQ community responded to the drought by establishing new governance structures, strengthening internal and expanding external networks, learning adaptively and implementing a whole-of-community approach.

Locally led governance helped to create, improve or transform organisations which have developed in response to drought. The Central West Rural Wellness Network (CWRWN) was created in response to the potential for increased mental illness and suicide during drought (Page and Fragar 2002; Edwards *et al.* 2015; Hart *et al.* 2011; Ebi and Bowen 2016). The CWRWN later deliberately improved by expanding its charter to build regional resilience. This group has become influential in coordinating a range of mental health and allied services under new delivery models. They also secured financial support services for town businesses, where previously this was only available to farms (Taffa 2015) – thus meeting a critical gap identified by the community. One organisation that transformed is RAPAD who consulted the community to develop local strategies for regional resilience (Cole 2016) and identified six priorities to grow the region (RAI 2017). These have informed local government actions and policy positions for engagement with state and Australian governments.

The CWQ community identified a need for improved governance after observing disjointed, uncoordinated, often

naïve and inappropriate crises-driven drought relief increasingly imposed by groups from outside CWQ (Kelly 2018). Churches, charities, service clubs, local and state government staff together raised concerns that external organisations were inadvertently undermining resilience through a lack of local engagement. Local groups started to seek complementary actions to address these issues. A well-attended public meeting led to the formation of the Western Queensland Drought Committee (WQDC) to help provide advice and coordination for philanthropic drought assistance (WQDA 2017) and document the impact of drought on town business and the community (Queensland Rural Debt and Drought Taskforce 2016). The improved coordination and identification of gaps allowed local groups to direct efforts towards maintaining business activity, employment opportunities and the population. For example: the WQDC distributes donations through pre-paid gift cards to farm and small-business owners to spend locally; the Longreach Baptist Church provided financial assistance for pastoralists to employ farm contractors to retain families in the region; the Uniting Church distributed emergency funds to town families facing financial distress. These actions reduce financial stress on families and concentrate funds into local businesses (Moore and Moore 2016). The estimated multiplier effect of the injection of new cash from outside a region ranges from 1.2 to 3.2, and flows through a regional economy to benefit more than the primary or secondary recipients (Domański and Gwosdz 2010; Stoeckl *et al.* 2007). The need to boost the cash economy was identified through locally-led governance and strong networks.

The strongly interlinked networks of CWQ have also helped facilitate the enhanced governance. For example, in Longreach, individuals are often members of a service club, church, parents and teachers association, sport or art club, and employed locally within small business, local or state government. These overlapping memberships and personal relationships mean people are often strongly connected with groups they are not members of, and information sharing is strong. These connections provide capacity to expand networks both within the region and outside the region through existing structures. The Uniting Church, Rotary International, Lions Clubs International and state government staff have allowed more effective communication between many extra-regional groups. The actions support the assumptions made by Stafford Smith and Huigen (2009) that intrinsic and extrinsic networking (Maru *et al.* 2007) are needed to improve rangeland socioeconomic systems.

Adaptive learning has improved the local and regional responses to drought. For example, the Longreach Rotary Club adopted a policy of reviewing every drought action to ensure it would help overcome sensitivity. It began to focus on building community resilience and social cohesion through special events such as outdoor movie and BBQ evenings. The Rotary Club's initial response of delivering hay, work boots and donated hampers direct to farmers, was displacing sales from local business. Potentially affected local family businesses were consulted and the future strategies emphasised the importance of assisting the local community by stimulating economic activity through cash donations, or purchasing hampers and other goods locally. Overall, the Longreach Rotary Club sought to continuously improve its approach and has helped move charitable responses away from a disaster relief model towards

overcoming sensitivity and building whole-of-community resilience.

CWQ has also learnt the importance of influencing the public narrative, and not allowing the region to be presented as a helpless victim in the face of adversity. Local media coverage has been encouraged to focus on stories which reinforce the adaptive capacity of CWQ, providing positive advocacy.

The pragmatic focus on whole-of-community support spread throughout the local community groups, local government, regional networks and locally-based State agency staff through established network linkages. External networks, advocacy and media attention were then able to carry the momentum into the Queensland and national discourse (Cripps 2018b, 2018c).

Extra-regional actions

The unified regional voice and community advocacy in CWQ has led to support from governments at all levels as well as from other organisations. An estimated \$2.5 million in philanthropic financial support has been attracted into the region through direct donations (WQDA 2017). A range of grants for targeted community projects, such as providing youth access to leadership training (FRRR 2018), has also been secured.

Longer-term solutions have been supported by the Australian and Queensland Governments, and included several investments to address both long-term and short-term needs, including:

- \$7.6 million grants to reinvigorate the CWQ sheep and wool industry, through building wild-dog proof fences to protect sheep. By providing local employment to build fences and the anticipated growth in wages for shearing, crutching has the potential for \$96 million total benefits to CWQ (Perkins 2013), a 25% increase in agriculture's economic contribution; and
- Longreach Regional Council secured a one-off loan of \$17.9 million from Queensland Treasury Corporation under an innovative scheme where council builds fences on the behalf of pastoralists, who repay construction costs through their rates over a 20-year period (Perkins 2013; Longreach Plus More 2016; Murray 2016). Increased capital works expenditure to \$8.2 million, and \$15 million in local wages, contributes to economic resilience (LRC 2018).

These responses have all addressed key issues identified from previous droughts, research and consultation with the local communities.

This is perhaps the first time that drought relief *per se* has been directed through a whole-of-community approach within Australia and suggests a move to policy which aims to build long-term regional resilience. It also suggests a move by the Queensland Government, the academic sector and others to engage meaningfully through multi-level partnerships (Davies and Holcombe 2009). These partnerships and improved investment are key aspects of the systemic approach called for by Stafford Smith and Huigen (2009) to build resilience in rangeland areas. While there are early positive signs for CWQ, it is too early to indicate how well this long-term investment will be sustained and what lasting benefits it will deliver.

Short-term strategies also have a place in overcoming vulnerability. The Queensland Government committed to retain short-term drought support measures for affected pastoralists during the 2015 election campaign, with grants delivered

to community projects, funding for mental health support continued commitment to the Drought Relief Assistance Scheme (DRAS) to provide freight subsidies and assistance for new water infrastructure and deliver extension services through a new Drought and Climate Adaptation Program (DAF 2018). Strong public empathy is evident when severe and extended drought impacts on farming livelihoods. However, this generally leads to *ad hoc* responses from different levels of government, the charitable and aid sector, which may not build long-term resilience.

Crisis-driven responses, although of immediate benefit, can increase regional sensitivity by displacing local business, e.g. free goods provided from outside unfairly compete with locally available goods, thus impacting on local-business viability. Actions that enhance governance, such as community groups expanding their networks (Maru *et al.* 2007) to bring support and assistance into the region or the establishment of new governance and engagement structures (Davies and Holcombe 2009), can create long-term improvements, and actions that enhance the potential growth of business networks and industries (Taylor *et al.* 2008) can contribute to livelihoods. Conversely, responses that reduce adaptive capacity or undermine the local economy represent the greatest risk of eroding resilience, and can occur without the respondent realising the consequences of their actions.

Despite the best efforts of community groups within CWQ to guide external support, some individuals or groups do not consider the longer-term ramifications of displacing goods, distorting markets or removing employment opportunities (Kelly 2018). Some contradictions in policy are inevitable, and some examples of policy leading to compromised or ambiguous outcomes are:

- public sector downsizing in CWQ (as outlined in Kelly 2018) led to out-migration of professionals from drought declared locations, reducing adaptive capacity and removing a source of economic stability. Centralised governance will not always be willing to engage at regional and local levels (Stafford Smith and Huigen 2009);
- some long standing policies in the context of broader socioeconomic reform may not be appropriate in the context of drought, such as boarding school fee subsidies to farm families. While this has the positive effect of raising education levels for recipients (ICPA 2018), it also diverts placements away from local high schools, reducing enrolments and reducing funding available to local students; and
- investment in pastoral industries will continue to improve viability through labour efficiencies (Holmes and McLean 2017) which simultaneously has the potential to undermine regional resilience through continued reductions of on-farm agricultural employment (BITRE 2104).

Policy makers need to be aware of such contradictions and local engagement is the only way to overcome these dilemmas.

Balancing responses to reduce vulnerability and build resilience

The generally opposing forces of vulnerability and resilience noted in this study and by Maru *et al.* (2014) are in the process of being addressed in CWQ during the current drought, as the

community expands its networks and proactively seeks to build resilience in multiple public and private partnerships. The actions of key individuals, groups and community governance structures from within the region, has led to all levels of government investing external resources towards addressing long-term structural issues in CWQ. The CWQ community has matured into actively promoting long-term investment to reduce vulnerability to future droughts by building resilience. Several initiatives to address vulnerability and build resilience are ongoing, and many local organisations are committed to supporting these on-going changes, in particular RAPAD, the various shire councils and many of the community organisations such as the WQDC and the church-based charities.

The region has modelled how grass-roots solutions can be supported by top-down investment of public, private and philanthropic resources. Drought resilience can be enhanced in regions with high exposure to drought by supporting existing community social capital and governance structures.

Generic lessons from the case study region

This paper found that a vulnerability framework (Kasperson *et al.* 2005; Adger 2006; Fussel 2007; IPCC 2014) needs to be linked with resilience (Walker *et al.* 2012; Maru *et al.* 2014; Bahadur 2016). Using both concepts will help ensure that both short-term and long-term drought responses are targeted to effectively overcome sensitivity factors, foster adaptive capacity and build long-term resilience. The most successful responses in CWQ mirror top-down support for grass roots actions, for example: external donations being distributed through the WQDC to help support economic activity; and government support of the tourism and agricultural industries.

The effective responses in CWQ align with the proposition of Stafford Smith and others, that vulnerability in rangeland systems can only be overcome through a systemic approach based around four key strategies:

- (1) capture place-based advantages (Stafford Smith and Cribb 2009; Kelly 2018);
- (2) enhance internal and external socioeconomic networks (Maru *et al.* 2007; Kelly 2018);
- (3) engage meaningfully through multi-level (local, regional and centralised) consultation and engagement (Davies and Holcombe 2009); and
- (4) build sustained financial investment (Stafford Smith and Huigen 2009).

This paper has presented examples of all of these as summarised below.

- (1) Growth within the tourism industry, which captures place-based advantages of landscapes, history and people through investment in facilities such as the Australian Stockman's Hall of Fame and the Qantas Founders Museum.
- (2) Internal and external socioeconomic networks strengthened through existing groups, such as Rotary International, and new regionally initiated groups such as the CWRWN and WQDC.
- (3) RAPAD successfully demonstrated multi-level (local, regional and centralised) consultation and engagement in uniting local government for shared services and advocacy.

- (4) Examples of sustained financial investment were scarce. However, some examples were outlined including public-private investment into solar power generation; and government investment into drought programs which all give cause for optimism.

The CWQ region appears to be better positioned for resilience than in 2015 through a range of systemic measures, but it remains to be seen if this regional rebuilding can be sustained. The consistency between the theory, conceptual frameworks and successful outcomes for CWQ suggests the CWQ examples have a much broader application for global rangeland communities.

Actions which are likely to help build resilience in other rangeland regions include:

- supporting local and regional community groups and networks to provide timely and relevant services that build social capital across regional communities;
- encouraging philanthropic responses to focus on whole communities, including town-based businesses, rural contractors and primary producers to maintain economic activity, while avoiding perverse outcomes;
- expanding intrinsic and extrinsic networks across multiple scales;
- building social cohesion in support of local support networks for mental health and wellbeing outcomes;
- supporting collaborative governance at national, state, regional and local levels to ensure consistent policy development and implementation that contributes to building long-term resilience;
- strengthening existing pastoralism through policy and investment that ensures healthy and productive landscapes, supports flexible management actions to respond to increasing rainfall variability, encourages continuous improvement of pastoralist's skills, and provides health services for the wellbeing of families; and
- creating diversified economic activities, especially place-based industries such as tourism.

The vulnerability assessment for CWQ demonstrates the usefulness of a vulnerability framework for rangeland regions, showing how to describe exposure factors, sensitivity factors and adaptive capacity (see 'Profiling vulnerability in CWQ' and Table 1). The most important aspect is how to balance actions that build regional resilience with actions that undermine resilience (the feedback loop of Fig. 1). In practice, the tables presented in this paper provide a template for others to use to describe regionally relevant vulnerability factors.

Conclusions

In this paper we recommend that other rangeland regions conduct vulnerability assessments to help understand the risks and hazards for rangeland socioeconomic systems. Whole-of-community views are powerful for informing robust regional drought plans. This will ensure effective and efficient policy implementation by considering exposure factors, reducing sensitivity and enhancing adaptive capacity to build drought resilience across the socioeconomic system.

Many communities around the world are inexperienced with climate variability. This places many communities at risk as weather patterns become increasingly variable. Without

adequate planning, sensitivity factors can increase to the point that relatively minor rainfall deficits are likely to have a major impact. The generational experience and adaptive knowledge from communities such as CWQ can help other regions plan for the resilience they need for a sustainable future.

The common theme of success in the CWQ region have resulted from local solutions supported by external networks and resources. The governance leadership shown by CWQ groups, the adaptive learning approach, strong interlinking networks and whole-of-community approach are all important aspects of this model.

The vulnerability framework could help prioritise investment to build future resilience to the impacts of drought and policies could better meet regional priorities. Grass-roots communities, local, state and national governments are beginning to recognise the need to identify issues and solutions at a regional scale, and to understand that the socioeconomic structure of rangeland regions is directly linked to variable rainfall patterns.

Assistance measures and programs to build regional resilience need to encompass whole communities, recognising that grazing and town businesses, and the social fabric of communities, are all interlinked and exposed to the effects of drought. Regional vulnerability profiles and actions to build whole-of-community resilience could become a standard approach used by local government or regional economic development agencies in drought planning. State and national governments should use these plans to guide investment and build partnerships with grass roots action.

Short-term responses to reduce vulnerability and long-term response to build resilience need to be complementary. As this case study has shown, regionally led responses can help build social cohesion, reduce the risk of suicide, enhance farm water security, stimulate economic activity and employment to reduce the impact of drought and boost regional adaptive capacity. Drought relief is now being directed through a whole community approach, and this change suggests a move towards policy which integrates short-term measures to overcome vulnerability with strategies to build long-term resilience. The question 'will this action build or undermine community resilience' needs to continue to be asked in the design of drought policies and responses.

Conflicts of interest

The authors declare a potential conflict of interest, as Dana Kelly was employed by the Western Queensland Drought Committee and David Phelps is the Chair of the Western Queensland Drought Committee, Past President of the Longreach Rotary Club and a member of the Central West Rural Wellness Network.

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A call for collaboration: linking local and non-local rangeland communities to build resilience

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Abstract. The people who live in Australia's rangelands are vital for maintaining natural systems, agricultural production, infrastructure for tourism and many services and products which benefit the nation. However, the number of people living within many rangeland regions is declining, services are being withdrawn and resilience undermined. Social capital is an important concept within the resilience literature. Bonding social capital is based strong ties within relatively homogenous local groups, bridging social capital is based on ties between more diverse local groups and linking social capital is based on ties between local and external groups. Within the rangelands, there are often strong bonding and bridging social capitals based on internal social and formal connections, but gaps in linking social capital due to weak or imbalanced connections with external groups and organisations. There is evidence that all three social capitals are needed for regional resilience, and the gap in linking is thus a key issue. People who live outside the rangelands can help rebuild this resilience by linking their skills, knowledge and expertise with local groups and communities. Many city-based scientists, policy makers, influencers and other professionals work in and have empathy for the rangelands. By connecting meaningfully with local groups such as Landcare, service clubs, philanthropic groups or Indigenous Rangers, they would find many benefits to their own endeavours through improved policies, knowledge and service delivery. Central-western Queensland is provided as an example where many such mutual benefits and networks already exist, offering pathways for linking local residents with external experts. Current platforms offer opportunities for a greater range of external academic institutions and organisations to engage with locals, with everyone standing to gain.

Keywords: adaptation, agriculture, grazing communities, outback, resilience of rangeland systems, social-ecological systems, tourism.

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Introduction

The people who live in Australia's rangelands are vital to maintaining natural systems and infrastructure, implementing environmental programs, protecting ecosystem function and biodiversity (Woinarski and Lewis 2017), maintaining and developing pastoral and tourism industries, servicing transport operations within supply chains and more (Phelps and Kelly 2019). A large number of scientists and other professionals visit the rangelands to deliver professional services and undertake research. They are as passionate as the locals about wanting a positive future for the rangelands through improved land management, adaptation to climate change and enhanced livelihoods (Foran *et al.* 2019). In this paper, the members of this professional community who visit, but do not permanently reside in the rangelands, are referred to as non-local.

In this commentary paper we call for stronger links between the local and non-local rangeland communities for mutually beneficial outcomes, including building greater resilience for biophysical and socioeconomic rangeland systems. A call for

greater collaboration in rural areas is not new, with examples from overseas (Cofré-Bravo *et al.* 2019) and in Australia (McAllister *et al.* 2008; Dale 2018; Foran *et al.* 2019; Kelly and Phelps 2019). We contribute to this discussion by using central-western Queensland (CWQ) as a case study region and provide examples of effective collaboration and networks which contribute to resilience. As a commentary paper, we do not seek to critically review the literature. Instead, we combine lived experience with a theoretical framework of social capitals to present ideas for other rangeland regions across Australia and internationally. Although more collaboration is called for, many examples of where people are successfully working together are provided and pathways are suggested for how non-local professionals can increasingly connect with locals.

Our premise is that more can be achieved through collaboration that generates benefits such as shared understanding and knowledge, combines resources and skills, and builds mutually beneficial outcomes. In some cases, collaboration may create opportunities that would not otherwise be possible.

The framework of bonding, bridging and linking social capitals (Putnam 1993; Szreter and Woolcock 2004) is used to explore collaboration within local groups, and between local and non-local groups in the CWQ case study region. The next section defines and discusses social capital from a theoretical perspective before outlining existing examples of each.

Bonding, bridging and linking social capital

Social capital refers to ‘features of social organisation, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions’ (Putnam 1993, p.167). From a networking or connecting perspective, the three main forms of social capital are bonding, bridging and linking, as defined below.

Bonding – where (generally) homogeneous groups of local people strengthen their ties through shared experiences, values and goals (Cofré-Bravo *et al.* 2019; Dressel *et al.* 2020).

Bridging – where local or regionally based people strengthen their ties through shared goals and desired outcomes, but are generally more heterogeneous in their values and experiences—often within structured settings (Cofré-Bravo *et al.* 2019; Dressel *et al.* 2020).

Linking – where local or regionally based people and groups strengthen ties with external individuals and groups, leveraging otherwise limited experience, knowledge, skills and resources, and often connects local citizen initiatives with formal institutions (Cofré-Bravo *et al.* 2019; Igalla *et al.* 2019; Dressel *et al.* 2020).

Bonding social capital corresponds with strong ties between individuals and homogenous groups, such as family and friends (Cofré-Bravo *et al.* 2019). Bridging can also correspond with strong ties through shared regional experience and contexts, whereas Linking social capitals tend to have weaker ties (Cofré-Bravo *et al.* 2019). These weak (or ‘wiry’) ties are important in rangelands, as they can provide efficient increase in resources in times of need (McAllister *et al.* 2011). Collaboration tends to be different between rangelands and coastal regions, partly because of vast distances with low population and huge climate variability over time – spatial and temporal differences impact the social capital.

Bonding and bridging appear to be the most common social capitals within rural communities (for example, Cofré-Bravo *et al.* 2019; in South America; King *et al.* 2019; in New Zealand). Many rangeland communities exhibit strong networks where local people support each other to manage in times of crisis (Rubin 2016). However, there are international examples where strong bonding ties can undermine cooperation with other stakeholders (Yoder and Chowdury 2018), or where bonding and bridging become parochial and insular, making it difficult for non-locals to link with locals (King *et al.* 2019). The same is likely to be true in the Australian rangelands, as strong internal bonding may exclude non-local participants (McAllister *et al.* 2008). Strong bonding social capital potentially can lead locals to reject knowledge and concepts that challenge their social norms (Smith *et al.* 2012).

Local and non-local knowledges develop in different contexts and are often communicated through language specific to each group (Brown 2010). Understanding these different languages and what knowledge is valued is one important step towards effective communication (Brown 2010; Ashwood *et al.*

2014). Both local and non-local communities need to accept and respect differing viewpoints. Non-local professional and scientist knowledge may be based in urbanised social norms as well as theoretical and academic knowledge. It is equally important for non-rangeland community members to understand the need to genuinely listen to local issues, and respect lived experience and solutions. Ashwood and colleagues (2014) propose that success arises through participatory deliberation, active information sharing and equality of knowledge value, which develops greater understanding for application to real-world issues.

There is evidence that community-based initiatives have the best success when all three social capitals are present (O’Brien *et al.* 1998; Halseth and Ryser 2007; Brown *et al.* 2016; Igalla *et al.* 2019; Igalla *et al.* 2020). The absence of linking social capital can lead to greater vulnerability (Straub *et al.* 2020), and by inference maintaining links between local and non-local networks is crucial for local resilience. We suggest that linking is the most important social capital to ensure resilience in CWQ. McAllister and colleagues (2011) agree with the need to develop and sustain efficient ties between local and non-local groups. A first practical step to enhance linking social capital is to introduce non-local professionals and researchers to existing local groups and networks. We draw on this concept from CWQ examples where collaboration through linking has been successful.

The next sections describe the CWQ case study region and outline existing opportunities for collaboration through local groups who have a proactive attitude towards engaging with non-local expertise, people and organisations. Then, examples are provided of mutual benefits of collaboration between local and non-local groups, and how this develops linking capital. The last section outlines potential lessons for other rangeland regions.

The CWQ case study region

Background

CWQ straddles the Tropic of Capricorn, from west of the Great Dividing Range to the Northern Territory and South Australian borders (see fig. 1 in Kelly and Phelps 2019). Compared with other rangeland regions mining occupies a relatively minor area (see Appendix 2 in Foran *et al.* 2019), and there is less land under Indigenous ownership or direct management than the rangelands of Western Australia or South Australia (see fig. 4 and Appendix 2 in Foran *et al.* 2019). Increasing collaboration and social capital in other regions would very likely need to include Indigenous communities as well as mining companies. The examples chosen from CWQ reflect the relatively high proportion of pastoral land, low proportion of Indigenous and mining land and high outmigration compared with other regions.

Vegetation is predominantly unmodified native grasslands, shrublands, open forest and desert ecosystems, which supports cattle and wool sheep production as the dominant land use (Phelps and Kelly 2019). The arid to semiarid climate is summer dominant with highly variable rainfall (Phelps and Kelly 2019).

The population is sparse and declining. The main towns of Barcaldine, Blackall, Birdsville, Boulia, Longreach and Winton each have populations of less than 4000 people (Kelly and Phelps 2019). Droughts have led to lower employment opportunities, and 20% of people migrated out of CWQ between 2007

and 2016 (Kelly and Phelps 2019). This leads to a smaller overall volunteer pool for leadership and governance roles, and less locally available skills, knowledge and ideas (described by Kelly and Phelps 2019 as the downward social cycle). From direct observation, there is an increasing tendency for the same individuals to hold leadership roles across multiple groups. There is evidence that community resilience declines as more groups become over-reliant on key individuals (McAllister *et al.* 2008), a risk of bonding and bridging social capitals being weakened, and a risk of accelerated loss of resilience (e.g. Straub *et al.* 2020). The declining population of CWQ increases the urgency for locals to collaborate with the non-local rangeland community.

Existing social capital: a platform for engagement and further linking opportunities

CWQ has many examples of local groups with strong social, informal and formal ties which underpin bonding social capitals (Appendix 1). Groups and informal settings in local towns create social spaces for friends, family and neighbours to share ideas, socialise and form bonding social capital which develop and reinforce local norms (Szreter and Woolcock 2004; Smith *et al.* 2012).

Bonding social capital in CWQ occurs through either formal local structures such as arts, sports and service clubs or informal settings such as social gatherings of neighbours (e.g. *ad hoc* meetings between individuals in community spaces whilst grocery, rural supplies or hardware shopping). One example of a formal local group intentionally building social capital is the Rotary Club of Longreach. They recognised the need to bring rural neighbours together to support mental wellbeing during the current (2012–present) drought. This resulted in the Club hosting outdoor movies and meals in various locations around the region, with the specific aim of promoting social cohesion and maintaining strong bonding social capital between people who know each other (Phelps and Kelly 2019).

Bridging social capital in CWQ occurs primarily through formal groups, such as the Central West Rural Wellness Network (CWRWN) and the community led Western Queensland Drought Committee (WQDC) (Appendix 1). Both have established bridging social capital by bringing together disparate local people with different experiences, skills and knowledge (Kelly and Phelps 2019). The Remote Area Planning and Development Board (RAPAD) was established to connect the seven local governments within CWQ, bringing people together who may not know each other through shared goals, resources and a united voice (RAPAD 2018) thus developing bridging social capital.

Locally lead groups such as CWRWN, WQDC, RAPAD and others actively reach out to external groups to collaborate, build linkages and develop their programs (Appendix 1). These organisations offer opportunities for other non-local groups to build pathways. For example, the Longreach based Natural Resource Management Organisation, Desert Channels Queensland (DCQ) has worked with local landholders to identify high priority areas for weed eradication, linking this local knowledge with non-local government expertise and funding. This linking social capital has enabled a successful program to eradicate 317 613 ha of the invasive woody weed, prickly acacia, which was not achieved before collaboration being established

(DCQ 2016, 2020). RAPAD collaborates with State and Australian government, accessing expertise and grant to develop programs to help create economic and population growth such as the renewal of the region's sheep and wool industry (RAPAD 2018). These partnerships with government departments have successfully developed linking social capital.

Recent collaboration between the Mithaka Aboriginal Corporation and Griffith University is laying a strong ethical platform for Australian and international scientists to access culturally significant sites (Griffith University 2020). This partnership addresses strategic goals for both organisations. The Mithaka people aim to better understand their country and culture: 'Understanding Mithaka Country, Culture and Mithaka people in the past and into the present is important to the Mithaka People. By integrating non-Indigenous scientific methods with Indigenous approaches and knowledge, we hope to build a thorough understanding of how Mithaka Country received her people and how she carried them in the past and will carry them into the future' (MAC 2017). Griffith University aims to 'establish trust between researchers and create a neutral platform for effective research; implement best practice research using culturally sensitive guidelines and principles; promote innovative research that traverses and benefits western and traditional knowledge' (Griffith University 2017). This partnership will provide strong linking social capital through collaboration and the process of delivering on the strategic goals of both groups.

Many local groups provide less-formal pathways for non-local rangeland community members to engage. For example, the Rotary Club of Longreach welcomes guest speakers on a wide range of topics. Non-local scientists conducting long-term ecological studies into bird migratory patterns (Bino *et al.* 2020), resource web interactions (Moran *et al.* 2019) and small-mammal ecology (Dickman and Robin 2014) would be welcomed as guest speakers to share their experiences, skills and expertise with Rotary, other local community service clubs, Landcare groups, RAPAD and DCQ. Their knowledge would also be welcomed into local school classrooms (both physically and virtually) to inspire local youth through examples of science within their own region, potentially providing educational benefits to future generations (Schweisfurth *et al.* 2018). Even simple, less formal, interactions such as these examples create opportunities to establish linking social capital and build regional resilience.

Collaboration in CWQ has been initiated both by the local organisations (e.g. RAPAD) and by external organisations. One example of collaboration initiated by an external organisation is James Cook University (JCU), which employs staff in CWQ and maintains a telecommuting hub at Longreach as part of their undergraduate medical training. Students live in Longreach to gain experience in rural medicine through the public hospital and a private medical practice. Whilst in Longreach, the students are encouraged to volunteer with local groups to better understand and enjoy life within this rangeland community (Phelps and Kelly 2019). The bonds formed have increased the number of JCU graduates returning to a rural town as a qualified doctor (Woolley and Ray 2019).

The examples of collaboration provided indicate there are multiple opportunities for local CWQ and non-local groups to form linking social capital. CWQ is one rangeland region that

proactively engages with non-local groups in a range of endeavours and there will be examples from other Australian and international locations. Importantly, these CWQ organisations tend to be open to approaches from non-local groups who can help achieve local goals, while achieving goals for the external group.

Not all local groups or non-local professionals may understand the potential shared benefits of collaboration. Some non-local groups have made efforts to collaborate and connect with local communities and groups; others have missed the opportunity to engage with locals. Possible reasons for a lack of collaborating include: (1) non-local organisations and individuals do not understand the wealth of knowledge and expertise grounded in local communities; (2) resource constraints within professional and academic institutions limit exploration (e.g. time, resources) of the potential co-benefits from engaging with local communities and groups; (3) non-local parties lack the knowledge of how to connect into local networks, or may assume that the locals do not wish to engage. The next section explores some of the benefits that have accrued to both locals in the CWQ case study region and to non-local rangeland professionals.

Benefits of collaboration in CWQ

The range of semiarid and arid landscapes, ecosystems, land uses, communities and socioeconomic systems across CWQ has lent itself to research, development, extension and conservation programs from a wide range of organisations over many decades.

Conservation outcomes have been enhanced within CWQ through local engagement. The protection of the once-thought-extinct night parrot (Murphy *et al.* 2017) was enhanced through collaborative management based on listening to local knowledge, experience and values through interviews with local graziers (Garnett *et al.* 2016). Local knowledge has enhanced conservation outcomes for threatened mound spring ecosystems (e.g. Fensham *et al.* 2011), and contributed to a better understanding of tree thickening processes (e.g. Fensham and Fairfax 2005) than biophysical research would have in isolation. In these examples, non-local research and conservation goals were both advanced.

The agriculture industry has benefitted from formal processes which link local knowledge with Queensland and national beef research priorities (NABRC 2020). For example, the CWQ identified issue of on-going drought and high climate variability attracted Meat and Livestock Australia (MLA), Australian and Queensland Government investment into research focussed on climate adaptation strategies (Climate Clever Beef, Bray *et al.* 2016). This has led to investment in research and extension services which links CWQ pastoral knowledge with the Bureau of Meteorology and the United Kingdom Meteorology Office for: (1) improved drought forecasts (through the Forewarned is Forearmed project; BoM 2020); and (2) enhanced climate products (through the Northern Australia Climate Program; NACP 2020). Research is stronger because of local knowledge, and local beef producers have benefitted as well as the cattle industry across northern Australia.

Local employment opportunities can be enhanced through collaboration. The Queensland Government's Drought and Climate Adaptation Program has provided resourcing for additional CWQ based extension staff within the Department of

Agriculture and Fisheries and DCQ through the GrazingFutures project (DAF 2018), and employment of CWQ based climate extension specialists by the University of Southern Queensland through the Northern Australia Climate Program (NACP 2020). Jobs have also been created through conservation and natural resource management initiatives, with Bush Heritage Australia (BHA 2020) and the Indigenous Land and Sea Ranger Program (Queensland Government 2019) employing staff within CWQ. Sustained investment in agriculture and conservation programs help redress the decline in employment opportunities within CWQ (Kelly and Phelps 2019).

There are many opportunities to build on existing, and create new linking social capital between local residents and non-local experts to build resilience in CWQ (e.g. improved professional grant writing for community projects) and enhance research programs (e.g. deeper understanding and insight through shared knowledge). The existing examples of collaboration demonstrate many mutual benefits and can act as inspiration to forge new linkages for the future. For some non-local rangeland scientists, influencers and other professionals, there may be a lack of recognition that local communities wish to engage, or lack of recognition of the mutual benefits that could arise through linking. The locals should not expect to be approached by non-locals, and it is also incumbent on local groups and community leaders to extend a welcoming invitation for the non-local rangeland community to become involved.

How can other rangeland regions benefit from the CWQ experience?

Australia's rangeland regions – and those around the world – require all three of the bonding, bridging and linking social capitals for a resilient future. Bonding and bridging usually develop naturally through existing informal and formal structures. Even though local volunteers and communities may be heavily committed, they tend to be strongly focussed on maintaining these social capitals. In the CWQ case study region, maintaining bonding and bridging social capitals is under increasing pressure from a declining pool of potential volunteers as the overall population declines. It is likely that local and regional groups (Appendix 1) will need to increasingly rely on non-local support for volunteers and resourcing to support solutions through local knowledge. Linking social capital is required to empower, inspire and support local and regional bonding and bridging ties.

For other rangeland regions, recognising the value of strengthening linking social capital is important. International evidence demonstrates that linking social capital is especially important during times of distress (e.g. disasters and drought). Rubin (2016 p402) made the case that 'linking capital provides access to non-redundant and strategically important resources in times of distress' and that it 'enables groups to leverage resources, ideas, and information from formal institutions beyond the community ... external assistance is often an important part of community adaptation'. Whilst Rubin (2016) discusses the case of natural disaster adaptation, we highlight that the concept equally applies to regions like CWQ that are under stress; where declining population and lost economic output during extended drought conditions (Kelly and Phelps 2019) means local resources are already at capacity. In these

cases, non-local resources are necessary to support fully committed local resources in order to build resilience.

Regions need to proactively identify pathways to establish linking social capital, and also recognise there are likely to be challenges. The CWQ examples suggest that existing bonding and bridging social capital can be important foundations for establishing linking social capital. Groups such as RAPAD were initiated to build regional ties and thus enhance bridging social capital. This expanded to becoming proactive in establishing linking social capital through formal partnerships. Equally, there are opportunities to start less-formal arrangements such as guest speakers at local clubs or schools. We suggest there are many rangeland regions with the potential to utilise existing bonding and bridging networks as pathways for collaboration with non-local groups to develop stronger linking social capital.

Establishing, maintaining and linking social capital is likely to include challenges for many regions, which may result from differing communication styles or values. There is also evidence that challenges can arise from imbalanced power structures (Szreter and Woolcock 2004). There is a risk that rangeland regions, distant from large urban population centres and well-resourced organisations, can be overlooked in favour of regions with greater access to decision makers and more resources to champion their causes. CWQ has addressed this risk through: (1) on-going advocacy to non-local influencers; (2) creating pathways to develop linking through formalised structures and groups as well as through the informal networks of community leaders; and (3) ensuring that mutual benefits accrue for both local and non-local organisation, by developing compatible goals for all organisations involved. For example, the WQDC provided evidence of the impact of drought on local town based small business to advocate state and national decision makers for greater resourcing (Kelly and Phelps 2019; Phelps and Kelly 2019). The WQDC established pathways to build linking by including representatives from service clubs, church groups and local government within their governance structure, and informal linkages by utilising the networks of individual members. This has made it easy for non-local philanthropic organisations whose goals are to support people facing hardship during drought to direct resources into CWQ (Phelps and Kelly 2019). At a more personal level, it is important to build mutual trust and respect between local and non-local organisations through effective communication, seeking to share knowledge and understanding values and social norms that have arisen from different experiences. Establishing and maintaining linking social capital is likely to include challenges, but it can be achieved by local groups through a proactive approach to establish trust, good communication and mutual benefits.

There is a need to find mutual benefits to encourage collaboration between local and non-local rangeland communities. Locals can identify local issues and will have often discussed possible solutions and explored innovations over an extended period. However, locals can benefit from external perspectives and fresh ideas, and additional resources for implementation. Much can be achieved through concerted voluntary effort within existing or emerging networks and ties – but a more strategic and coordinated approach is necessary to address chronic issues. Declining resident populations, reduced livelihoods, increased vulnerability to drought and disasters and reduced capacity to

manage land for productivity, sustainability and conservation outcomes requires the linked efforts of local and non-local rangeland communities.

Shared issues and solutions can contribute to mutually beneficial outcomes. Ten contemporary themes have been identified across Australia's rangelands (Table 1, based on Foran *et al.* 2019; Nielsen *et al.* 2020). We suggest that linking social capital is the key gap for seven of these themes: 'natural capital'; 'governance'; 'research and development'; 'the social licence to operate'; 'technology opportunities and threats'; 'capital leakage'; and 'human capacity and capability' (Table 1). These seven themes either: (1) represent an externality where it is essential to link local solutions to the non-local source (e.g. the social licence to operate originates from external markets and societal values); or (2) a situation where local resources alone are inadequate to address the theme (e.g. with a declining total population in CWQ, strengthening 'human capacity and capability' requires both linking to non-local volunteers for additional capacity and training locals in areas such as governance to improve capability).

The lived experience from CWQ provides examples for other rangeland regions to adapt to their own context and seek opportunities to strengthen linking social capital to build resilience.

The call to collaborate: foster linking social capital across local and non-local rangeland communities

Linking social capital is crucial to building resilient communities and regions, generating shared knowledge and successful application of science to real-world problems. As the lived experience of CWQ and the literature (e.g. Fensham *et al.* 2011; Bray *et al.* 2016; Garnett *et al.* 2016; NACP 2020) indicate, the opportunity exists to develop linking social capital through engagement with existing local groups to benefit academic and conservation outcomes. A key challenge is in facilitating the first steps for engagement, and linking different knowledge systems to build a place of lasting trust and dialogue. Although a strategic and coordinated approach to developing linking social capital is needed to build resilience in the biophysical and socioeconomic systems of the rangelands, the shared passion of local and non-local rangeland communities provides a practical starting point.

Most rangeland regions have ample opportunities for non-local experts to engage with local and regional groups to build linking social capital, to share in rewarding discussion and undertake joint action. Shared knowledge will grow when non-local expertise is engaged with local knowledge and experience. Longer-term benefits will accrue by engaging with youth, for example if world-leading academics take the time to speak in classrooms this could inspire a new generation of scientists and leaders.

Many benefits can accrue for the non-local rangeland community if they engage with locals. We invite every rangeland professional to reach out to one of the many groups embedded in the region. Equally, we invite local groups and individuals to seek out the non-local rangeland experts working within their region and invite them to link more closely to the local community. Although CWQ was used as the example for this commentary paper, we have no doubt that the potential for collaboration, mutual benefits and building resilience is similar across all of Australia's rangelands and in other parts of the world.

Table 1. Key Australian rangeland themes (adapted from Foran *et al.* 2019; Nielsen *et al.* 2020) and a commentary on gaps in bonding, bridging and linking social capitals within CWQ which limit resilience

Theme/social capital	Bonding	Bridging	Linking
	Characterised by strong ties shared between local people based on common experiences, values and goals, bonding can be assumed to develop naturally	Characterised by strong ties between local organisations, groups and people or within a broader region with common goals, bridging can be assumed to need proactive participation to develop	Characterised by ties between regions, states or internationally with mutually beneficial reasons to connect, linking can be assumed to need effort and structured approaches, or strong leadership and interpersonal relationships, to develop
Livelihood: supporting local communities	Minor gap. There is localised support between businesses for skills, knowledge and community events	Key gap. Small business coordination and peer support is weak within the region e.g. no coordinated approach to 'buy local' campaigns and limited opportunities for peer mentoring to improve business resilience Specific needs include: recognition within CWQ of the need for small business peer mentoring, skills and knowledge sharing, creating a culture of support and leading to proposed regional solutions which can then explore opportunities for linking of resources and expertise	Secondary gap. Linking could support efforts but the desire for coordination needs to come from within the region
Natural capital	Minor gap. DCQ approach to weed control involves groups of neighbours; wild-dog exclusion fencing provides opportunities for neighbour collaboration; land management solutions often discussed in community settings	Secondary gap. There is limited sharing of land management approaches and knowledge at the regional level	Key gap. Natural capital changes on grazing lands are largely driven by external factors e.g. meat and wool prices failing to include the cost of natural capital; lack of linking between local knowledge and non-local funding and programs. Whilst there are examples from RAPAD and DCQ of strong linking capital, consistent and sustained linking is needed Specific needs include: sustained effort into sustainable grazing systems which balance economic and environmental pressures; discovery research into flora and fauna population dynamics and distribution; creating opportunities to embed regional economic growth with conservation of natural place based assets
Climate: variability and change	Minor gap. Contention remains over strength of anthropomorphic contribution to climate change with local opinion divided	Key gap. Insufficient collaboration within the region and between groups to establish an effective coordinated adaptation response to climate: variability and change Specific needs include: strong regional leadership which addresses scepticism of scientific evidence based in nuanced discussion that meets local values and observations of variability and weather extremes	Secondary gap. Information and programs to address climate change are established but sustained linkages are needed through external programs such as DCAP
Traditional knowledge (including Younger and more Indigenous)	Key gap. Potentially, the ability to progress traditional knowledge is limited by weak collaboration at local levels Specific needs include: supportive processes which facilitate bonding to develop	Minor gap. There may be less need for sharing of knowledge between different groups of traditional owners, however a coordinated approach in seeking recognition is essential	Secondary gap. Linking could support efforts but the desire for coordination needs to come from strong and united local traditional owner groups, as demonstrated by the Mithaka-Griffith University partnership

(Continued)

Table 1. (Continued)

Theme/social capital	Bonding	Bridging	Linking
Governance	Minor gap. There is strong sharing of knowledge, skills and volunteers between local groups which reinforces good governance	Secondary gap. There is strong bridging of local government through RAPAD; however there is limited sharing of knowledge, skills and volunteers between community groups across the region; more formalised bridging may find solutions to the declining population and smaller volunteer pool	Key gap. Strong governance exists at local bonding (e.g. well administered local clubs) and regional bridging levels (e.g. RAPAD) with sustained linking needed to empower and resource these local and regional arrangements; there is an increasing need for the volunteer pool to include non-locals as the CWQ population declines Specific needs include: structures which support local and non-local collaboration within groups e.g. contra arrangements that support board positions such as secretarial services, effective linking of non-local volunteers with local groups
Research and development	Minor gap. There is generally strong sharing of knowledge, skills, ideas and solutions between neighbours at local levels	Secondary gap. There are many innovations by individuals which are shared informally, but not always beyond local networks	Key gap. There is research and development across CWQ in a range of topics, especially the beef industry (e.g. through the WQRBC) which should be expanded across industries, but it does not link with local people or groups in a way that can build resilience Specific needs include: climate change adaptation, weather extreme preparedness, enterprise and land use economic analysis, sustainable natural capital management, place based regional opportunities, the role of traditional knowledge in modern society, socioeconomic systems and policy support mechanisms for declining long-term local and shorter-term 'nomadic' workforce
The social licence to operate	Secondary gap. The impacts of the lack of a broad social licence are greatest at the local level, but solutions will arise through linking	Minor gap. Regional bridging of groups can support linking social capital between external and local groups	Key gap. The social licence to operate is driven by external factors, linking social capital is essential to understand values, ideologies and address global issues at local levels Specific needs include: identifying good industry practices for promotion to consumers, finding alternatives to unacceptable practices; identifying globally acceptable industry drivers e.g. eco-tourism which conservation of natural capital, grazing practices which reduce carbon miles to market, livestock enterprises which preserves endangered domesticated species
Technology opportunities and threats	Minor gap. Strong networks amongst peers usually spread technology ideas quickly, and social norms tend to guide local implementation	Secondary gap. There may be a need to increase the sharing of ideas to implement technology between regional groups, especially to identify solutions to potential threats	Key gap. Most technology opportunities and threats arise from external sources e.g. for town based business, the ability to remain competitive with global on-line shopping competition relies on modern internet connectivity Specific needs include: creating job opportunities by encouraging ag-tech companies to be based within the region, maximising opportunities to use technology such as broadband internet to attract tele-commuting jobs

(Continued)

Table 1. (Continued)

Theme/social capital	Bonding	Bridging	Linking
Capital leakage	Minor gap. Individuals and local groups are relatively powerless to prevent capital leakage, as their influence is on local markets e.g. initiatives that create incentives for local people to shop locally will have limited impact compared with investment through linking	Secondary gap. Bridging is needed as a platform to establish linking, and in aspects such as providing advocacy for the region, attracting business investment and enhancing local professionalism in conducting business	Key gap. Capital leakage from CWQ is through poor value adding within the region e.g. unprocessed wool sold from the region, with jobs and economic stimulation occurring elsewhere; linking social capital is required to create opportunities between the points of production and value adding closer Specific needs include: finding ways to create more regional value adding to increase retention of wealth and enhance power equality with larger population centres
Human capacity and capability	Secondary gap. Local communities, groups and leaders have an essential role in supporting non-locals to feel welcome, identify shared goals and mutual benefits, to increase their desire to spend time in the region	Minor gap. Regional groups such as RAPAD can provide structured pathways for non-locals to link with locals, but the overall structures and attitude of local people is probably more important to form long-term ties	Key gap. With a declining population, the future of human capacity and capability for CWQ will necessarily be through linking. Specific needs include: finding ways for 'modern nomadism' to thrive and enrich communities e.g. socio-economic and policy structures systems which support tourism and hospitality employees to work the peak winter season in CWQ and the peak summer season in southern regions

Conflicts of interest

The authors declare no conflicts of interest.

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Appendix 1. Example central-western Queensland (CWQ) based community groups, organisations and governing groups^A, their areas of operation and the key social capitals they foster

Group	Area of operation	Main (and secondary) social capital	Short description and key citation
Australian Government (Centrelink, National Drought and North Queensland Flood Response and Recovery Agency)	Service CWQ, primarily located in Longreach or Barcardine	Linking (bridging)	Australian Government agencies within CWQ primarily link national services to local communities and people, often with staff who act as local 'champions' to advocate for continued resourcing of services within their agencies; staff often volunteer within local organisations
Queensland Government Departments (e.g. Agriculture and Fisheries, Premier and Cabinet, Environment and Science, Transport and Main Roads, Health, Police Service)	Service CWQ, primarily located in Longreach or Barcardine	Linking (bridging)	Queensland Government agencies within CWQ primarily link state-based services to local communities and people, often with staff who act as local 'champions' to advocate for continued resourcing of services within their agencies; staff often volunteer within local organisations
Remote Area Planning and Development Board (RAPAD)	CWQ	Linking (bridging)	Initiated by the seven CWQ Local Governments to collectively promote and advocate for the region and more effectively coordinate services and resourcing
RAPAD Employment Services Queensland	CWQ and south-west Queensland	Linking (bridging)	Initiated within CWQ to link employment services with Australian Government programs
Rural Financial Counselling Service North Queensland	CWQ within a national setting	Linking (bridging)	Administered by RAPAD to deliver State and Commonwealth funded confidential, free and impartial rural financial counselling services to primary producers, fishers and small rural businesses experiencing financial difficulties
Desert Channels Queensland (DCQ)	CWQ	Linking (bridging)	Founded through a Commonwealth initiative in 2002 to establish community groups to deliver regionally based natural resource management (NRM), DCQ operates from Longreach and links Commonwealth and Queensland Government NRM programs with regional priorities.
Western Queensland Drought Committee (WQDC)	CWQ plus south and north-west	Linking (bridging)	Initiated by the CWQ community in 2015 to seek and direct external philanthropic and public funds into local drought relief
Bush Heritage Australia	Conservation lands within CWQ (and beyond)	Linking	Link national programs with external, and often international, funding and deliver on-ground conservation and biodiversity outcomes for key ecosystems e.g. mound springs
Indigenous Land and Sea Rangers	CWQ within a national program	Linking	Indigenous Land and Sea rangers deliver negotiated work plans that reflect Traditional Owner, local community, and Queensland Government priorities and provides employment opportunities for indigenous people within environmental, cultural heritage and community engagement activities
Royal Flying Doctor Service (RFDS)	CWQ within a national setting	Linking (bridging)	A national not for profit organisation with a base in Longreach, it provides emergency medical airlifts, regular health clinics and mental health services to areas that don't have access including CWQ; it was initiated in north-west Queensland in 1927
Western Queensland Regional Beef Research Committee (WQRBC)	CWQ and south-west Queensland	Linking (bridging)	One of eleven regional committees chaired by beef producers with broad industry representation which play a key role in developing priorities for Meat and Livestock Australia's annual call for grass-fed beef research, development and adoption projects
Central West Rural Wellness Network (CWRWN)	CWQ	Bridging (linking)	Initiated within CWQ as a forum for front-line service agencies to share and discuss well-being initiatives and address on-ground needs, especially for the prevention of suicide during drought, and to advocate for effective resourcing

(Continued)

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Group	Area of operation	Main (and secondary) social capital	Short description and key citation
Chambers of Commerce (e.g. Longreach Regional Enterprise)	Within local towns	Bridging (linking)	Typically, not for profit groups which represent business interests in their local community, the only example in CWQ is Longreach Regional Enterprise which formed in 2016 to promote and advance trade, commerce and industry in the Longreach region
Red Ridge Interior Queensland Ltd	CWQ and south-west Queensland	Bridging (linking)	Initiated within CWQ to contribute to healthy and resilient communities, with linkages to external philanthropic and public funds as a member of a Queensland network of regional arts service providers
Longreach Multipurpose group	Longreach and district	Bridging (linking)	Initiated within CWQ as an umbrella organisation over all sport, youth and recreational groups in Longreach, provide a collective voice and access to external grants
Longreach Retired Services League Sub Branch	CWQ	Bonding (linking)	Founded locally in 1918, it is one of the earliest sub branches in Queensland, it runs a Services and Memorial Club and supports veterans, serving members and the wider community
Churches (e.g. Catholic, Anglican, Uniting, Salvation Army)	Within local towns, linked through formal structures	Bonding (linking)	Christian churches continue to play a strong bonding role within CWQ and are linked through formal structures to national and international networks
Service Clubs (e.g. Meals on Wheels, Rotary, Lions, Lioness, Zonta, Country Womens Association, Masonic Lodge)	Varies according to clubs, but generally district	Bonding (linking)	These clubs are generally branches of regional, state, national and often international organisations, each club was initiated and is run locally; they generally have a district or regional focus e.g. The Lions Club of Longreach also service towns 200–300 km away.
Arts and cultural groups	Within local towns	Bonding	Local groups with formal or informal structures which offer meeting places and bonding through shared interests in art and craft
Sporting clubs (e.g. local squash, tennis, touch football, golf, rifle)	Within local towns	Bonding	Local sporting clubs bring people together for social and competitive sport and provide opportunities to learn about effective governance and administration
Sporting competitions (e.g. Rugby League, cricket)	Locally based clubs within CWQ based competitions	Bonding (bridging)	Sporting competitions provide opportunities to travel to other towns and regions to compete and socialise more broadly and provide opportunities to learn about effective governance and administration
Local Government	Designated government areas within CWQ	Bonding (linking)	Local Government within CWQ run many community events within towns to maintain social cohesion, provide the fundamental needs of towns (e.g. potable water and sewerage) and deliver state-based programs
Indigenous corporations (e.g. Mithaka Aboriginal Corporation, Pitta Pitta Aboriginal Corporation, Waluwarra Georgina Sulieman Rivers People Aboriginal Corporation, Central Queensland Indigenous Development, Central West Aboriginal Corporation, Winton District Aboriginal Corporation)	Traditional lands within CWQ	Bonding (linking)	Indigenous corporations within CWQ are varied in their structure and function ranging from linking University based research to preserve traditional knowledge (e.g. a partnership between the Mithaka people and Griffith University) through to delivering government services to local indigenous people (e.g. the Central West Aboriginal Corporation)

^AIncluding examples of government agencies with offices and services permanently based in CWQ.